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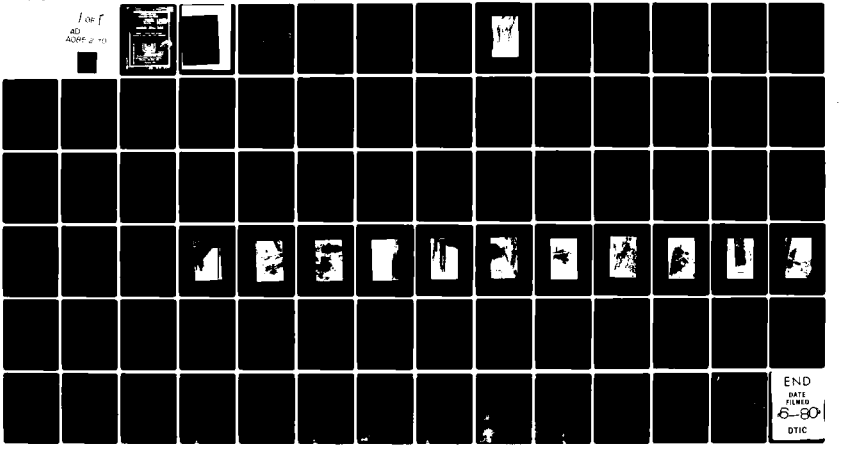

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DELAWARE RIVER BASIN

SPRING CREEK

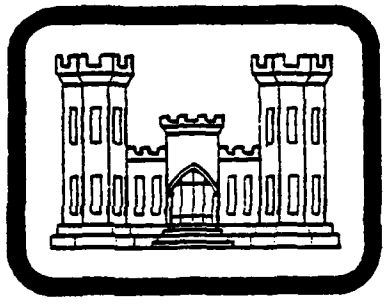
National Dam Inspection Program.

SPRING MILL DAM

~~LEHIGH COUNTY, PENNSYLVANIA~~

(NDS I.D. ~~NO.~~ Number PA ~~00~~785
DER I.D. ~~NO.~~ Number 39-1), Delaware River Basin, Spring Creek, Lehigh County, Pennsylvania.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



(12) 81

(10) Mark F. Boyer
John A. Blume, Jr.

Prepared by:

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5120 Butler Pike
Plymouth Meeting, Pennsylvania 19462

DACW31-80-C-0018

Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

(11) March ~~1980~~ 1980

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation· however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Spring Mill Dam
County Located:	Lehigh County
State Located:	Pennsylvania
Stream:	Spring Creek
Coordinates:	Latitude 40° 42.0'
	Longitude 75° 31.1'
Date of Inspection:	November 16, 1979

Spring Mill Dam, built in 1889 and 1900, is owned by Northampton Borough Municipal Water Authority. The dam and reservoir are currently used as a secondary water supply for Northampton Borough, Pennsylvania.

The dam and its appurtenant facilities are considered to be in good condition. The dam is classified as a "Small" size structure with a "Significant" hazard classification, consistent with its appreciable economic loss and possible loss of life in the event of failure.

In accordance with criteria established by Federal (OCE) Guidelines, the spillway design flood for this "Small" size dam and "Significant" hazard classification ranges from the 100 year event to 0.5 PMF (Probable Maximum Flood). As the height of this dam is near the lower limit for small size dams, and the total capacity is less than one-third the upper limit, the selected spillway design flood is the 100 year event. Hydrologic and hydraulic computations presented in Appendix D indicate that the structure will not pass the 100 year event without overtopping. It is further assessed that the 100 year event would not cause failure or significantly increase the potential for excessive property damage and loss of life downstream of the dam. Therefore, the spillway systems of this structure are considered to be "Inadequate" but not "Seriously Inadequate".

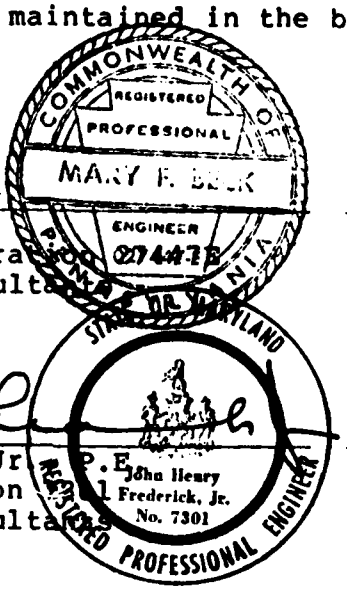
It is recommended that the following measures be undertaken as soon as practical.

1. All pond drain controls should be made operational.

2. The mortar joints in the bridge parapet wall and the spillway retaining wall should be repaired.

3. The flashboards, which reduce the spillway capacity, should be removed.

Because of the location of the dam and the potential for significant or appreciable property damage and possible loss of life in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning water treatment plant personnel if high flows are expected and provisions for evacuating these people in the event of an emergency. In addition, an operation and maintenance procedure should also be developed to insure that all pertinent items are carefully inspected on a regular basis and maintained in the best possible condition.



Mary F. Beck — 3/18/80

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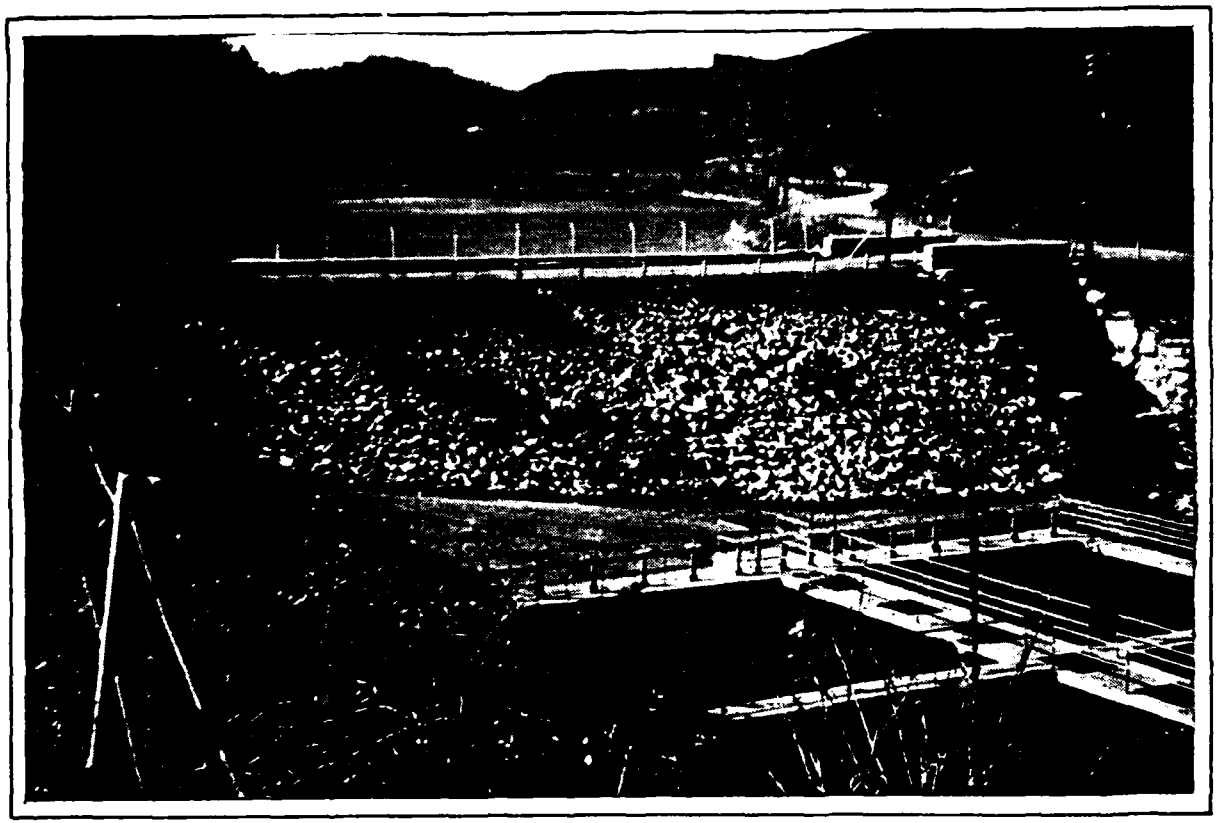
APPROVED BY:

25 APR 80

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date



OVERVIEW
SPRING MILL DAM, LEHIGH COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
SPRING MILL DAM
NATIONAL ID NO. PA 00785
DER NO. 39-1

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Spring Mill Dam is a masonry and earth/rock dam about 27 feet high and 235 feet long. Very limited data exists regarding the physical features of the dam. Blueprints in the Pennsylvania Department of Environmental Resources (DER) files were traced in 1914, from the original records obtained from C. D. Weirbach, the engineer in charge of construction, dated 1899 and 1900. The drawings indicate that the rubble masonry wall is 5.5 feet wide at the top. The upstream masonry slope is 1H:12V and the downstream masonry slope is 1H:2V. The cutoff wall appears to be up to 15 feet below the existing ground line or rock line. Rock or earth and rock fill on the downstream slope has a slope of 2.5H:1V, although a slope of 1.5H:1V is shown on the plans. A paved two lane road crosses over the breast of the dam.

An "L"-shaped broad crested weir forms the spillway at the left end of the dam. Spillway discharge flows over the stepped downstream face of the weir, under a stone arch bridge, and discharges over bedrock about 30 feet beyond the dam.

A masonry screen chamber, shown as 16 feet square on the blueprints, is located upstream of the dam at approximately its midpoint. Drawings show two intakes, 12 feet and 21.5 feet below the spillway crest, which admit water into the chamber from which the flow is carried through a 16 inch main to the water treatment plant downstream. A 30 inch cast iron

pond drain pipe is below the 16 inch main water supply line, 29 feet below the spillway crest. As shown in Photograph 5, there are three intakes on the right side of the structure, reportedly at about 8, 12 and 16 feet below the water surface.

b. Location. The dam is located across Spring Creek in North Whitehall Township, Lehigh County, Pennsylvania. The dam site is located approximately one mile north of Cementon, Pennsylvania. The dam site and reservoir are located on the USGS Quadrangle map entitled, "Cementon, Pennsylvania", at coordinates N 40° 42.0' W 75° 31.1'. A regional location plan of Spring Mill Dam and reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as a "Small" size structure by virtue of its 27 foot height and estimated total capacity of 269 acre-feet.

d. Hazard Classification. A "Significant" hazard classification is assigned consistent with the dam's location above a water treatment plant and the potential to cause economic loss and possible loss of life downstream of the dam at the treatment plant.

e. Ownership. Spring Mill Dam is owned by the Northampton Borough Municipal Water Authority. All correspondence should be addressed to Mr. Richard Paul, Manager, Northampton Borough Municipal Water Authority, 1717 Main Street, Northampton, Pennsylvania 18067.

f. Purpose of Dam. The dam was built and is used as a water supply dam. It is currently used as a secondary source of water. The Lehigh River is the primary water supply source.

g. Design and Construction History. Information concerning the construction of the dam is limited to blueprints in DER files. The dam, known as Mill Creek Dam, was built in 1899 and 1900, for the Clear Springs Water Company. The present Water Authority was founded in 1940. No other state files were available for review.

h. Normal Operating Procedures. Water is drawn off as needed through the upper two intakes to the 16 inch pipe leading to the treatment plant located immediately downstream of the dam. Treated water is pumped to Cementon Reservoir for storage, as shown on Plate 1. Excess flow discharges over the stone spillway, flowing beside the treatment plant and entering the Lehigh River approximately 900 feet downstream of the dam.

1.3 Pertinent Data.

The summary of pertinent data for Spring Mill Dam is presented as follows.

a.	Drainage Area (square miles)	3.0
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Dam Site	Unknown
	At Top of Dam	960
c.	Elevation (feet above MSL)	
	Top of Dam	348.7
	Spillway Weir Crest[1]	345.0
	Water Supply Intakes	337, 333, 329
	Pond Drain Inlet	316.0
	Pond Drain Outlet Invert	312.1
	Downstream Toe	322.1
d.	Reservoir Length (feet)	
	Length at Normal Pool	1,400
e.	Storage (acre-feet)	
	To Spillway Crest (normal pool)	230
	To Top of Dam	269
f.	Reservoir Surface Area (acres)	
	Normal Pool	9.3
g.	Embankment Data	
	Type	Masonry and rock or earth and rock
	Volume	6,538 cu yds masonry 8,000 cu yds rock or earth/rock (est)
	Length	235 feet
	Height Above Downstream Toe	26.6 feet
	Top Width	28.5 feet
	Side Slopes	
	Upstream	1 H:12V
	Downstream	2.5H: 1V
	Cutoff	Masonry cutoff excavated up to 15 feet below ground line
	Grout Curtain	None

(1) Spillway crest elevation assumed to be 345.0 from USGS Quadrangle map. All other elevations are relative.

h. Spillway

Type	"L"-shaped broad crested weir
Weir Crest Elevation	345.0
Pond Drain Inlet	316.0
Pond Drain Outlet Invert	312.1

i. Outlet Works

Type	Masonry screen chamber
Water Supply	
Intake Elevations	337, 333, 329
Outlet	In downstream plant
Pond Drain	
Type	30 inch CIP
Inlet Elevation	316.0
Outlet Elevation	312.1

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. The only data available for review are the blueprints located in the Department of Environmental Resources (DER) files. There were no other records available for review. There is no record of any engineering analysis performed for this dam.

b. Design Features. The principal design features of Spring Mill Dam are illustrated on Plates 2 through 6, Appendix E. Data for these sections were obtained from the blueprints in the state files. A description of the design features is also described in Section 1.2, paragraph a, and pertinent data relative to the structure is presented in Section 1.3.

2.2 Construction.

Beyond the limited information given in Section 1.2, there are no data available concerning the construction history of this dam and reservoir.

2.3 Operational Data.

There are no operational records maintained.

2.4 Evaluation.

a. Availability. Information presented herein was obtained from the records located in DER files in Harrisburg, Pennsylvania, and from conversations with the Owner's representative.

b. Adequacy. The available data included in the state files together with the visual inspection are considered adequate to evaluate the design of the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of the limited available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix A, and are summarized and evaluated in the following subsections. In general, the appearance of the facility indicates that the dam is in good condition. Plan and cross-sections of the dam are shown on Plates 2 and 3, Appendix E.

b. Dam. During the visual inspection, there were no indications of distortions in alignment or grade that would be indicative of movement of the dam or the foundation. The vertical alignment of the dam was checked and elevations are shown on sheet 5b, Appendix A. No discernible horizontal displacement or bulging was noted along the crest. The visible portion of the upstream face of the dam is the masonry wall, 5.5 feet wide at the top, which has been capped with a two foot wide concrete wall, and is shown on Photographs 7 and 9, Appendix C. The exposed masonry and concrete portion is generally in good condition. Near the right abutment, stone masonry was extended and soil placed on the upstream side of the wall. Some deterioration of the mortared joints has occurred in this area, and the concrete cap has been displaced up to four inches laterally; see Photograph 9. The exposed portion of the stone masonry is also damaged. It is undetermined whether the damage is limited to the exposed masonry or extends a significant distance underground. It is assessed that the damage is of a limited extent.

The crest of the dam is paved with a bituminous concrete pavement. The pavement is in generally good condition, but with a large area of alligator cracking near the left abutment. The cause of the cracking could not be determined. The downstream slope is rock, as shown in Photograph 8, which appears to have been dumped from the top of the dam. Larger pieces are towards the bottom of the slope. No woody vegetation was noted growing in the rock, although there are large patches of fairly high weeds. It is unknown whether the downstream portion of the dam is rock or rock overlying earth. No seepage was observed either at or beyond the toe of the downstream slope. A small gully was detected in the grass at the downstream toe; the gully was judged to be insignificant.

c. Appurtenant Structures.

1. Spillway. The spillway is "L"-shaped, as shown on sheet 5a, Appendix A, with the shorter leg perpendicular to the masonry dam. The longer leg is perpendicular to a retaining wall, which is parallel to the left abutment. Flashboards have been added to the spillway, as shown on Photograph 1. These flashboards are about 10 to 14 inches high and are held in place by pipes driven into the stone. It is assessed that these would fail during a large storm.

A bridge spans the area between the left abutment and the masonry dam, as shown on Photograph 2. The bridge and spillway are generally in good condition, but with some cracks and deterioration of the mortared joints noted in the bridge parapet walls and the retaining walls of the spillway, as shown in Photographs 10 and 11. The cracks appear to be limited to the parapet wall and do not extend to the bridge floor.

The spillway channel below the bridge, shown on Photographs 2 and 3, is assessed to be in good condition. Spillway discharge flows under the bridge and then over bedrock to a plunge pool located below the dam. The channel between the plunge pool and a downstream railroad culvert was rehabilitated in 1977.

2. Outlet Works. The exposed portions of the masonry screen chamber, shown in Photograph 5, were inspected and appear to be in good condition. The wooden top could not be removed to inspect the interior of the chamber. The upper two intakes were exercised; the lower intake is inoperable. The pond drain conduit is gated at the upstream end and at the downstream toe. The upstream gate is nonfunctional, and flow through the pond drain is controlled at the downstream valve. A small amount of water was flowing through the pond drain conduit at the time of the inspection, as shown in Photograph 6. The original cast iron conduit has been extended by reinforced concrete pipe, and this discharges into the stream channel about 135 feet beyond the dam. Two other valves at the toe of the dam control the flow of water between the treatment plant and the reservoir and tank on top of the hill. A third valve controls the drain line from the tank. The drain line from the tank can also draw off water from upstream of the dam. A schematic diagram, as reported by the plant operator, is included on sheet 5a.

d. Reservoir. The reservoir slopes are moderate to steep. A roadway parallels the north side of the reservoir, and a steep hill with trees and rock outcrops is on the south side of the reservoir. A considerable amount of sediment has been deposited at the upper end of the pool; however, this

should have little effect on flood water storage. There was very little debris noted along the reservoir side slopes.

e. Downstream Channel. Immediately below the dam, the spillway discharge falls over bedrock, as shown in Photograph 2, to a plunge pool. About 200 feet downstream of the dam is the treatment plant. The minimum channel section is located near the access bridge to the treatment plant. At this point, the channel is about 39 feet wide and 12 feet deep. About 500 feet downstream from the dam, the channel flows under a high concrete arch highway bridge, shown in Photograph 3. About 800 feet below the dam, the channel passes under Conrail tracks, through the culvert shown in Photograph 4, and then discharges into the Lehigh River. It is reported that the Lehigh River backs up to the access bridge in the plant area during large storms. The downstream damage center is limited to the treatment plant below the dam. Failure of the dam would result in the loss of a secondary water supply and possible damage to a treatment plant serving about 40,000 people, therefore causing an appreciable economic loss, and a significant hazard potential classification is justified.

3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam or spillway. Interior portions of the screen chamber could not be inspected. Not all pond drain controls are operational, which should be corrected. The dam and spillway systems are considered to be in good condition, as the extent of the damaged masonry is assessed to be of a limited extent. Items of preventive maintenance to be noted are the repair of mortared joints in the bridge parapet wall, the spillway retaining wall and the exposed portions of the right end of the dam. Also noted were weeds on the downstream face which should be cut on an annual basis.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Operation of the dam does not require a dam tender. Under normal conditions, water for treatment is drawn off through the upper two intakes in the screen chamber, as needed. Excess water is discharged over the spillway adjacent to the left abutment.

4.2 Maintenance of the Dam.

No routine maintenance procedures were reported beyond the cutting of weeds on the downstream slope. As the Water Authority owns the road crossing the dam, there is no confusion over responsibility for maintenance of the dam.

4.3 Maintenance of Operating Facilities.

No operating procedures were reported.

4.4 Warning Systems In Effect.

There is no written warning procedure in effect for this dam. The downstream damage center is the treatment plant located immediately below the dam, where at least one employee is always on duty.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities of Spring Mill Dam. In conclusion, it is noted that formal operational, maintenance and warning procedures should be developed and implemented as soon as practical. These procedures should include an inspection checklist, which would include a list of items that should be checked during each inspection and repaired as necessary to insure proper performance of the structure.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. There is no original design or subsequent evaluation data available for this dam.

The watershed is about 2.9 miles long and averages less than a mile wide, having a total area of three square miles. Elevations within the watershed range from about 745 feet in the upper reaches to 345 feet at normal pool elevation. The watershed is approximately ten percent wooded and the rest is open land with scattered residential development.

In accordance with criteria established by Federal (OCE) Guidelines, the spillway design flood for this "Small" size dam and "Significant" hazard classification ranges from the 100 year event to 0.5 PMF (Probable Maximum Flood). As the height of this dam is near the lower limit for small size dams, and the total capacity is less than one-third the upper limit, the selected spillway design flood is the 100 year event.

b. Experience Data. There are no records of reservoir levels or rainfall kept for this dam. There are no estimates or records of previous high water levels. It is reported that the dam was overtopped in 1945, but no other information about that event is available.

c. Visual Observations. On the date of the inspection, the only condition observed that would indicate a reduced spillway capacity is that flashboards have been added to the spillway. It is considered likely that these flashboards would fail in the event of a large storm. Other observations regarding the condition of the downstream channel, spillway and reservoir are presented in Appendix A and are discussed in greater detail in Section 3.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the HEC-1, Dam Safety Version, computer program. A brief description of the program is included in Appendix D. The selected spillway design storm for this dam is the 100 year event. The peak inflow rate calculated by the computer program is 1,425 cfs. This value was checked against the peak inflow value as determined according to procedures in the "Regional Frequency Study, Upper Delaware and Hudson River Basin, New York District" report prepared by the Hydrologic Engineering Center in

California. There was very good correlation between the two procedures. Calculations for this investigation indicate the maximum spillway capacity to be about 960 cfs with the water level at the minimum top of the dam. With the flashboards in place, the maximum spillway discharge is estimated to be only about 530 cfs. The computer program indicates that the 100 year event will overtop the embankment by about one-half foot without flashboards and about one foot with flashboards, although the flashboards would probably fail before the dam was overtopped by the full one foot.

e. Spillway Adequacy. A spillway that will not pass the spillway design flood without overtopping the dam is rated as "Seriously Inadequate" provided two other conditions are present. One is failure of the dam by overtopping. As this dam is assessed not to fail by overtopping, either with or without flashboards in place, the spillway system is considered to be "Inadequate" but not "Seriously Inadequate".

f. Downstream Conditions. About 200 feet downstream from the dam is the major downstream hazard center, the water treatment plant. About 500 feet beyond the dam, the channel flows under a large concrete arch highway bridge, as shown in Photograph 3. About 800 feet below the dam, the channel passes under Conrail tracks, through the culvert shown in Photograph 4, and then discharges into the Lehigh River. Sudden failure of the dam would flood the water treatment plant shown in Photograph 3, and could possibly damage the plant and cause loss of life, as well as result in loss of the secondary water supply serving about 40,000 people. Therefore, because of the appreciable potential economic loss, a "Significant" hazard potential classification is justified.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The only evidence of existing or impending dam or spillway instability detected by visual observations would be that the right end of the exposed masonry wall was damaged. Although the damage was assessed to be of a local nature, its extent should be verified by further detailed investigation.

b. Design and Construction Data. Design drawings and a stability analysis do not exist for this structure. Based on the dam's longevity and lack of visual signs of significant deterioration, it is qualitatively assessed that the stability of the dam is adequate.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. A post-construction change noted was the addition of the concrete cap to the upstream masonry wall. This cap serves to increase the height of the dam by about 0.7 feet above the design crest elevation. In addition, the present three level water supply intake arrangement is different from what is shown on the 1917 blueprint and probably is a post-construction change.

e. Seismic Stability. The dam is located in Seismic Zone 1. Normally it is considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. As the dam is qualitatively assessed to be stable under static loading conditions, it can reasonably be assumed to be stable under seismic loading conditions.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection indicates that the dam, foundation and spillway structures of Spring Mill Dam are in good condition.

In accordance with criteria established by Federal (OCE) Guidelines, the spillway design flood for this "Small" size dam and "Significant" hazard classification ranges from the 100 year event to 0.5 PMF (Probable Maximum Flood). As the height of this dam is near the lower limit for small size dams, and the total capacity is less than one-third the upper limit, the selected spillway design flood is the 100 year event. Hydrologic and hydraulic computations presented in Appendix D indicate the structure will not pass the 100 year event without overtopping. It is further assessed that the 100 year event would not cause failure or significantly increase the potential for excessive property damage and loss of life downstream of the dam. Therefore, the spillway systems of this structure are considered to be "Inadequate" but not "Seriously Inadequate". The structure itself has a "Significant" hazard classification.

b. Adequacy of Information. The combined visual inspection, obvious performance history of the structure, and simplified calculations presented in Appendix D were sufficiently adequate to evaluate the structure.

c. Urgency. It is recommended that the measures presented in Section 7.2 be implemented as soon as practical.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be undertaken as soon as practical.

1. All pond drain controls should be made operational.

2. The mortar joints in the bridge parapet wall and the spillway retaining wall should be repaired.

3. The flashboards, which reduce the spillway capacity, should be removed.

b. Operation and Maintenance Procedures. Because of the location of the dam and the potential for significant or appreciable property damage and possible loss of life in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning water treatment plant personnel if high flows are expected and provisions for evacuating these people in the event of an emergency. In addition, an operation and maintenance procedure should also be developed to insure that all pertinent items are carefully inspected on a regular basis and maintained in the best possible condition.

APPENDIX

A

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Spring Mill Dam* County *Lehigh* State *Pennsylvania* National ID # *PA 00785*

Type of Dam *Masonry & Rock/Earth* Hazard Category *Significant*

Date(s) Inspection *11/16/1979* Weather *Sunny* Temperature *50's*

Pool Elevation at Time of Inspection *345+* M.S.L. Tailwater at Time of Inspection *N/A* M.S.L.

Inspection Personnel:

Mary F. Beck (Hydrologist) *Vincent McKeever (Hydrologist)*

Arthur H. Dvinoff (Geotechnical/Civil)

Raymond S. Lambert (Geologist)

Mary F. Beck Recorder

Remarks:

Mr. Robert Crawford, other Northampton Borough Water Authority Employees, and a nearby resident were on site and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

CONCRETE/MASONRY DAMS

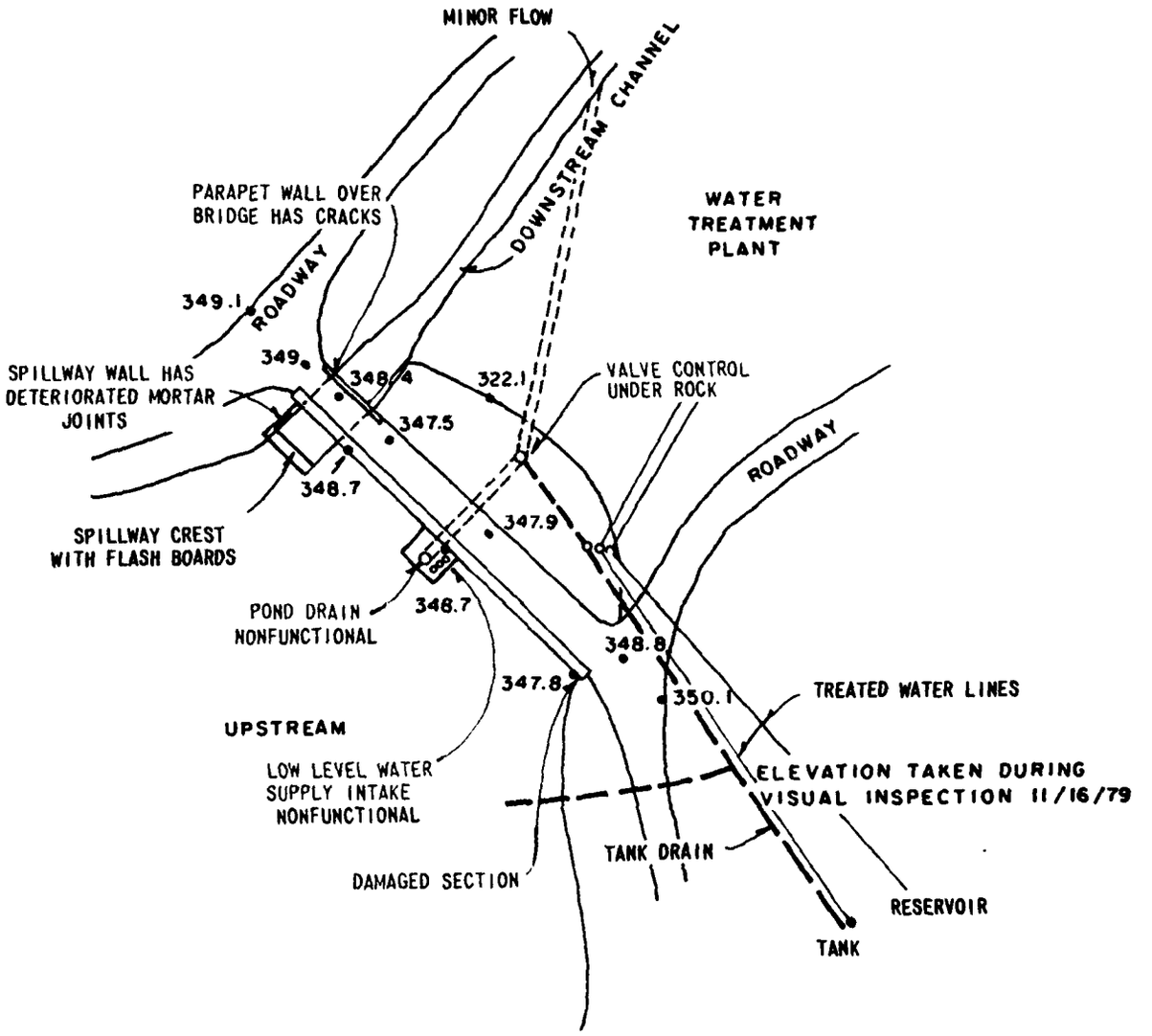
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*The only cracking observed was of the bituminous concrete roadway over the crest of the dam near the bridge over the spillway channel. The cause of the cracking could not be determined.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*None observed.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*Vertical and horizontal alignment were checked and found to be good, except for settlement of the concrete parapet wall near the right abutment; see Photograph No. 9, Appendix C.*	
RIPRAP FAILURES	*None observed, the riprap appears to have been placed by dumping from the top of the dam, see Photograph No. 8, Appendix C.*	

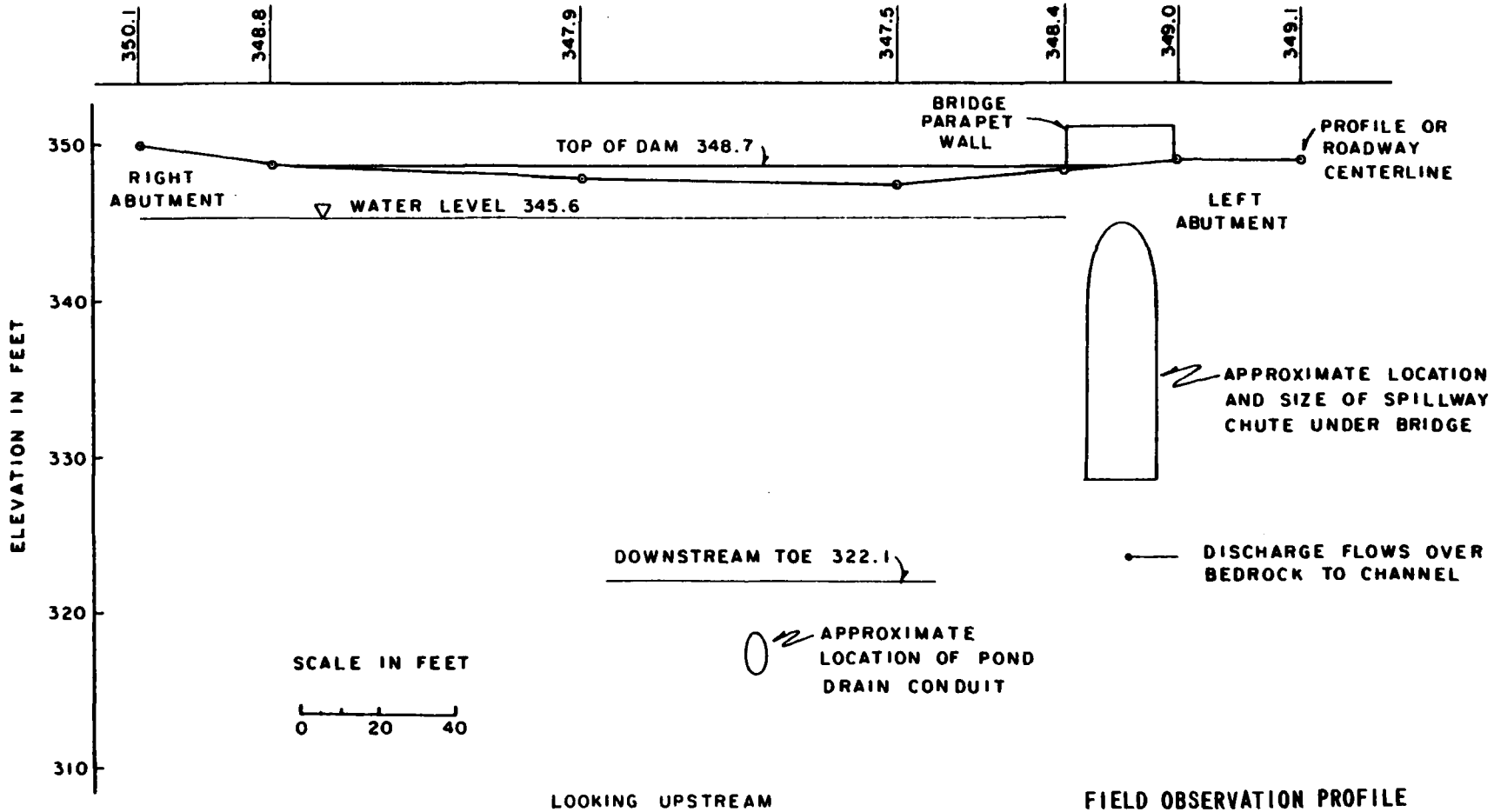
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*All junctions appeared in good condition with the exception of the right end of the upstream wall, see Photograph No. 9, Appendix C.*	
ANY NOTICEABLE SEEPAGE	*None observed.*	
STAFF GAGE AND RECORDER	*None*	
DRAINS	*None located.*	



FIELD OBSERVATION PLAN
SPRING MILL DAM

SHEET 5A OF 11



FIELD OBSERVATION PROFILE
SPRING MILL DAM

SHEET 5B OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*All conduits are under the dam and could not be inspected with the exception of the outlet of the 30-inch pond drain conduit, which appears in good condition.*	
INTAKE STRUCTURE	*The exterior of the stone masonry intake structure (above water) appears in good condition. The wooden cover over the interior could not be moved to inspect the interior.*	
OUTLET STRUCTURE	*None. Three pipes go directly to the treatment plant below the dam. The gate of the deepest intake can not be moved, the upper two gates operate.*	
OUTLET CHANNEL	*The pond drain gate is frozen open, flow is controlled by a valve at the downstream toe of the embankment.*	
EMERGENCY GATE	*The pond drain is reportedly controlled at upstream end.*	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
STONE WEIR	*The L-shaped weir (see Photographs, Appendix C) appears in good condition. Flashboards have been added to the top of the weir.*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*The channel under the bridge and immediately downstream of the bridge appears in good condition without excessive deterioration of the shale bedrock.*	
BRIDGE AND PIERS	*The underside of the bridge over the spillway channel appears in fairly good condition with some deterioration of mortored joints; see Photograph No. 10 and 11, Appendix C.*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*N/A*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	
GATES AND OPERATION EQUIPMENT	*N/A*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Reservoir slopes are moderate to steep. A roadway parallels the north side of the reservoir and a steep hill with trees and rock outcrops are on the south side of the reservoir.*	
SEDIMENTATION	*Sedimentation of the reservoir has no effect on flood water storage.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The downstream channel appears in good condition, reportedly having been rehabilitated in 1978. About 350 feet downstream, an access road crosses the stream. About 800 feet downstream Conrail tracks cross the stream. The culvert under the railroad is a stone and brick arch about 8 feet wide and 6 feet high.*	
SLOPES	*The valley gradient through the plant area is about 0.028.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*The Northampton Borough Water Treatment plant serving 40,000 people is located immediately below the dam. This plant is manned 24 hours per day.*	

APPENDIX

B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Spring Mill Dam*

ID # *PA 00785*

ITEM	REMARKS
AS-BUILT DRAWINGS	*See Appendix E.*
REGIONAL VICINITY MAP	*See Appendix E.*
CONSTRUCTION HISTORY	*Virtually unknown, see Section 1.2 paragraph 'g'.*
TYPICAL SECTIONS OF DAM	*See Appendix E.*
OUTLETS - PLAN	*See Appendix E.*
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	*See Appendix D.*
RAINFALL/RESERVOIR RECORDS	*None*

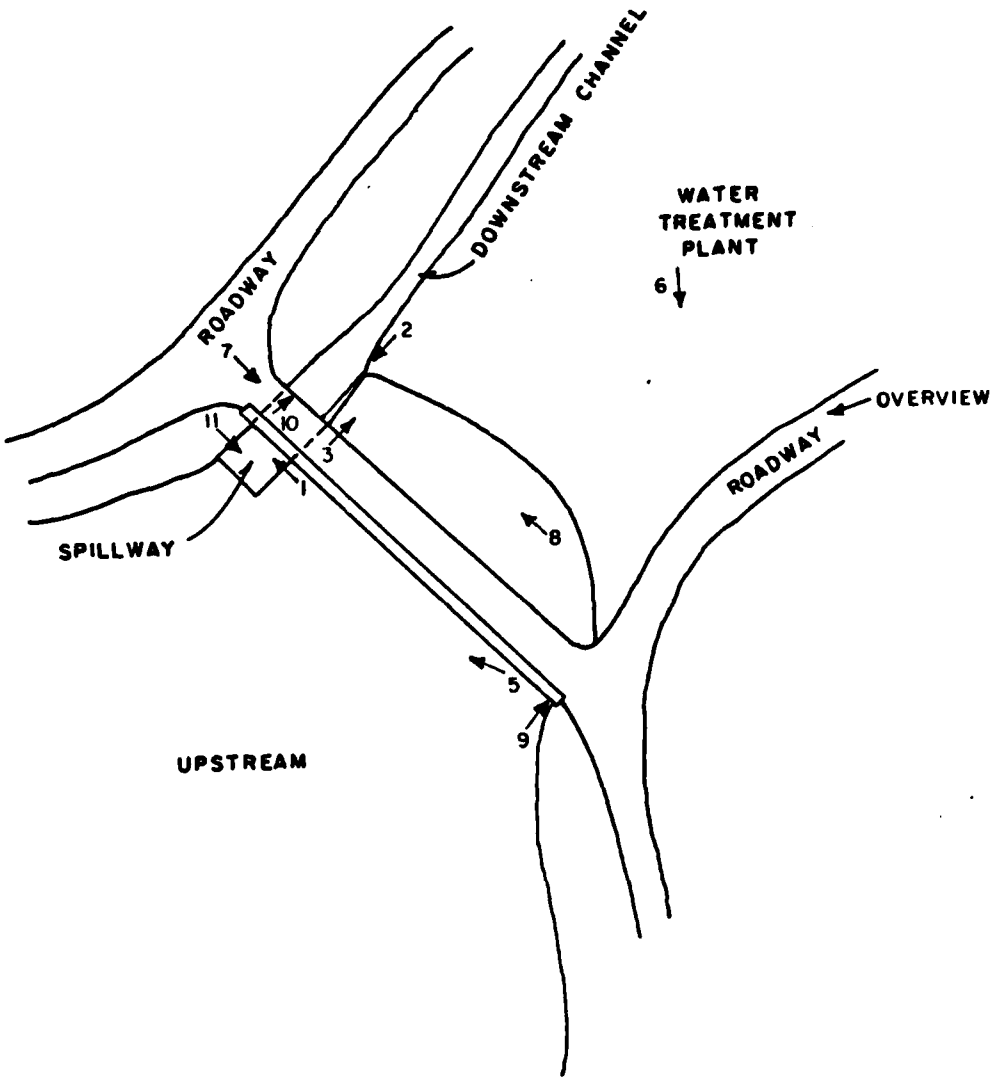
ITEM	REMARKS
DESIGN REPORTS	*None*
GEOLOGY REPORTS	*See Appendix F.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*No original computations or previous evaluations available.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*None*
POST-CONSTRUCTION SURVEYS OF DAM	*None known.*
BORROW SOURCES	*Unknown.*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*None known.*
HIGH POOL RECORDS	*None*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None known.*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*Reported overtopping.*
MAINTENANCE OPERATION RECORDS	*None*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*See Appendix E.*
OPERATING EQUIPMENT PLANS & DETAILS	*None*
MISCELLANEOUS	*Blueprints in DER files.*

APPENDIX

C



PHOTOGRAPH LOCATION PLAN
SPRING MILL DAM

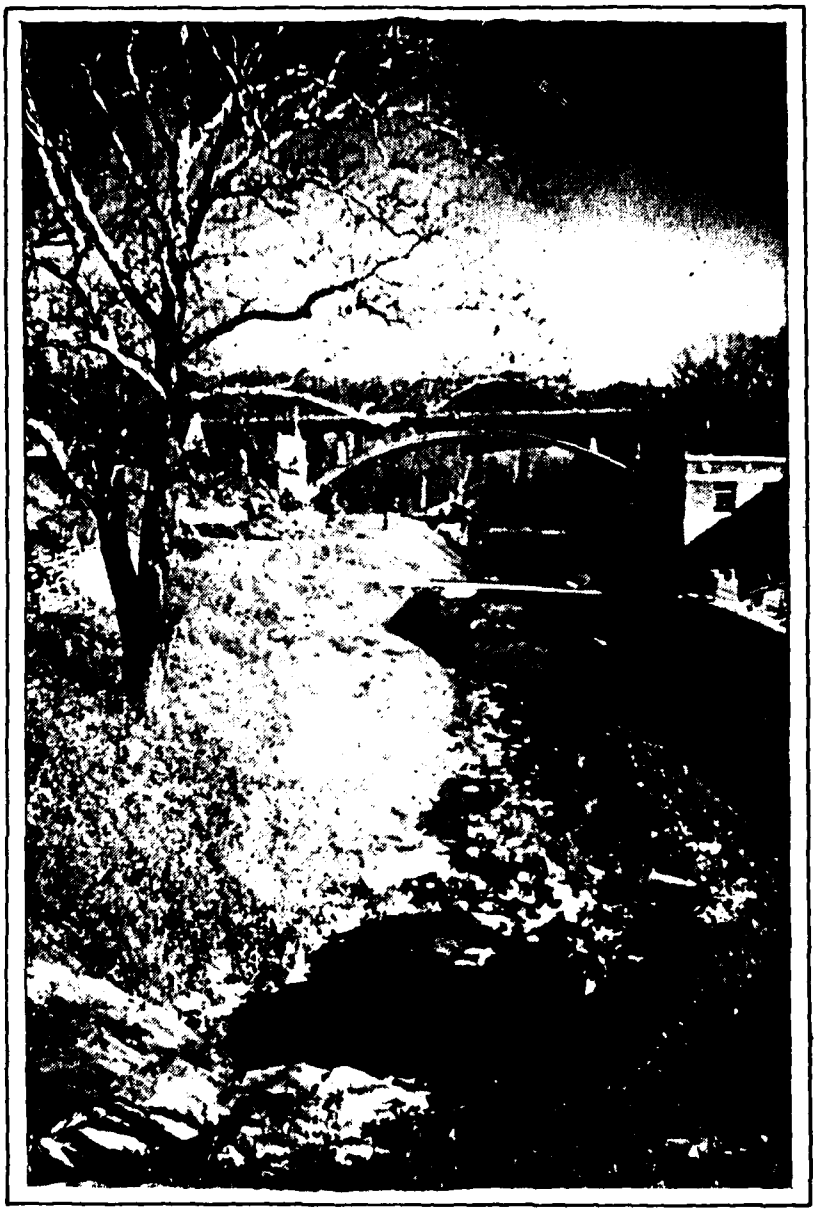
PLATE C-1

SPILLWAY WITH FLASHBOARDS.

PHOTOGRAPH NO. 1

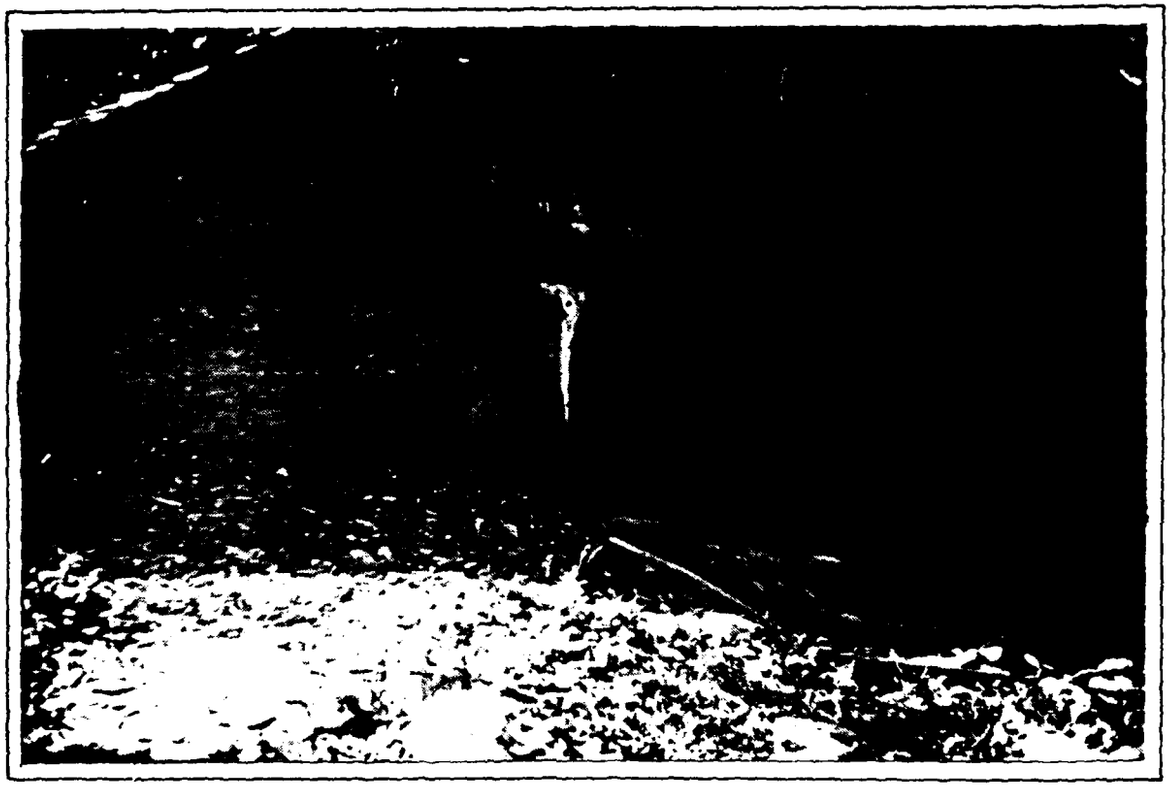
DOWNSTREAM SIDE OF SPILLWAY.

PHOTOGRAPH NO. 2



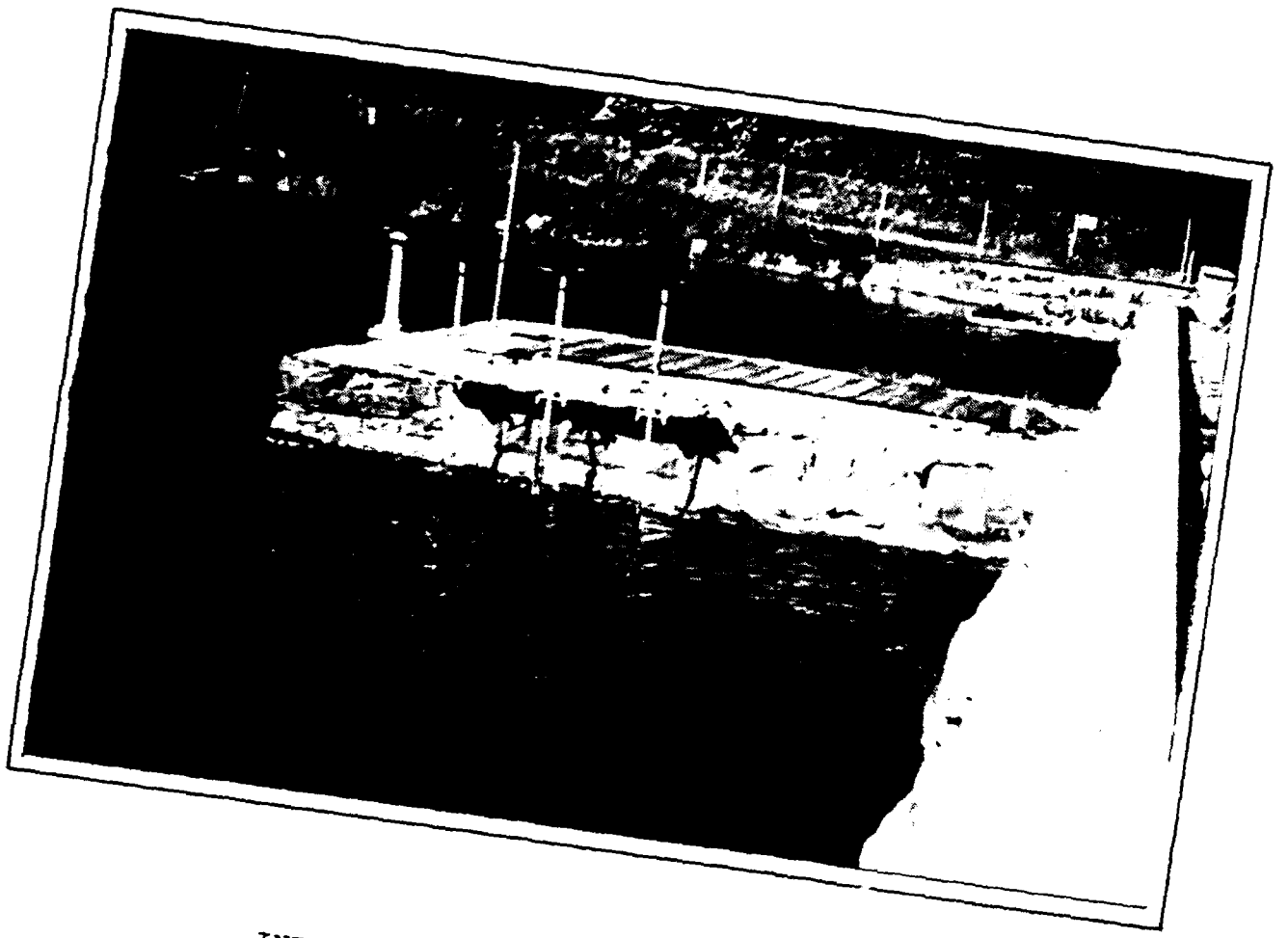
VIEW OF DOWNSTREAM CHANNEL
AND DAMAGE CENTER.

PHOTOGRAPH NO. 3



CULVERT UNDER RAILROAD TRACKS. THE CULVERT IS ABOUT 8 FEET WIDE AND 6 FEET HIGH.

PHOTOGRAPH NO. 4

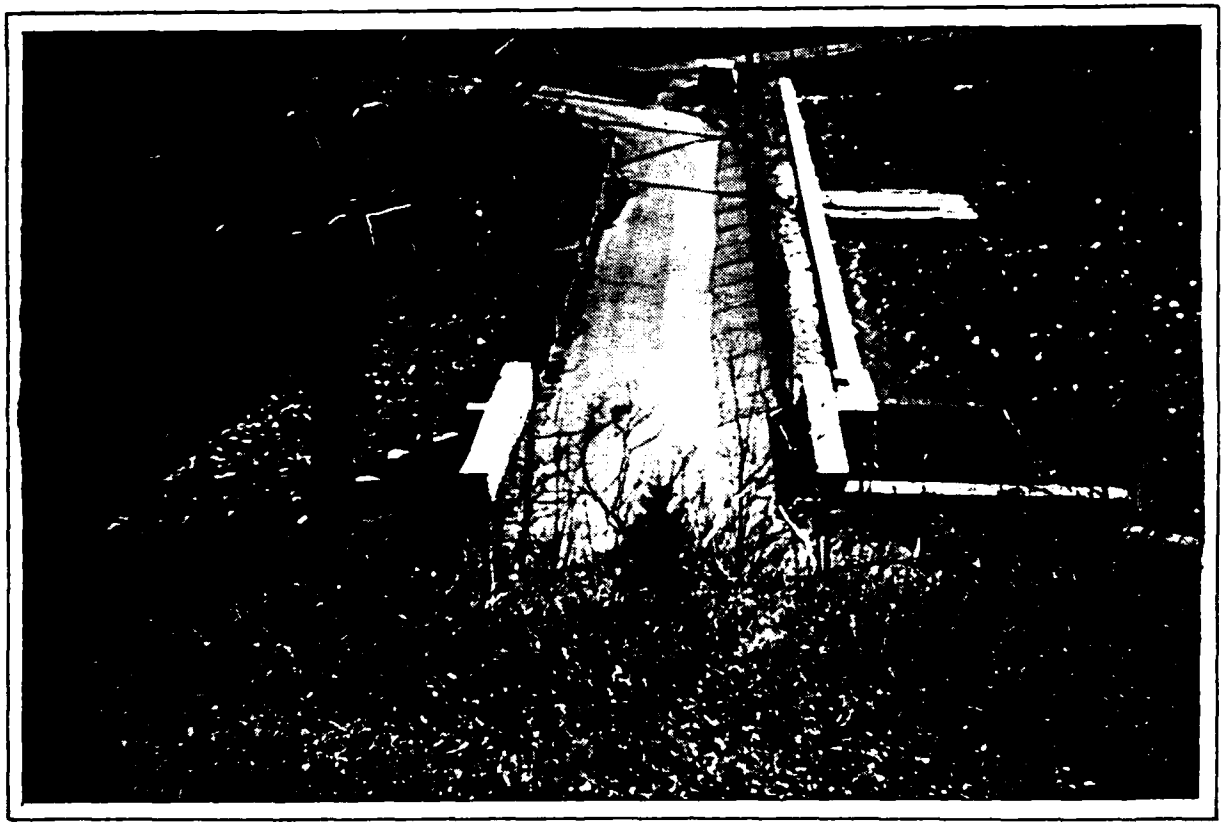


INTAKE STRUCTURE.

PHOTOGRAPH NO. 5

POND DRAIN OUTLET.

PHOTOGRAPH NO. 6



OVERALL VIEW OF CREST.

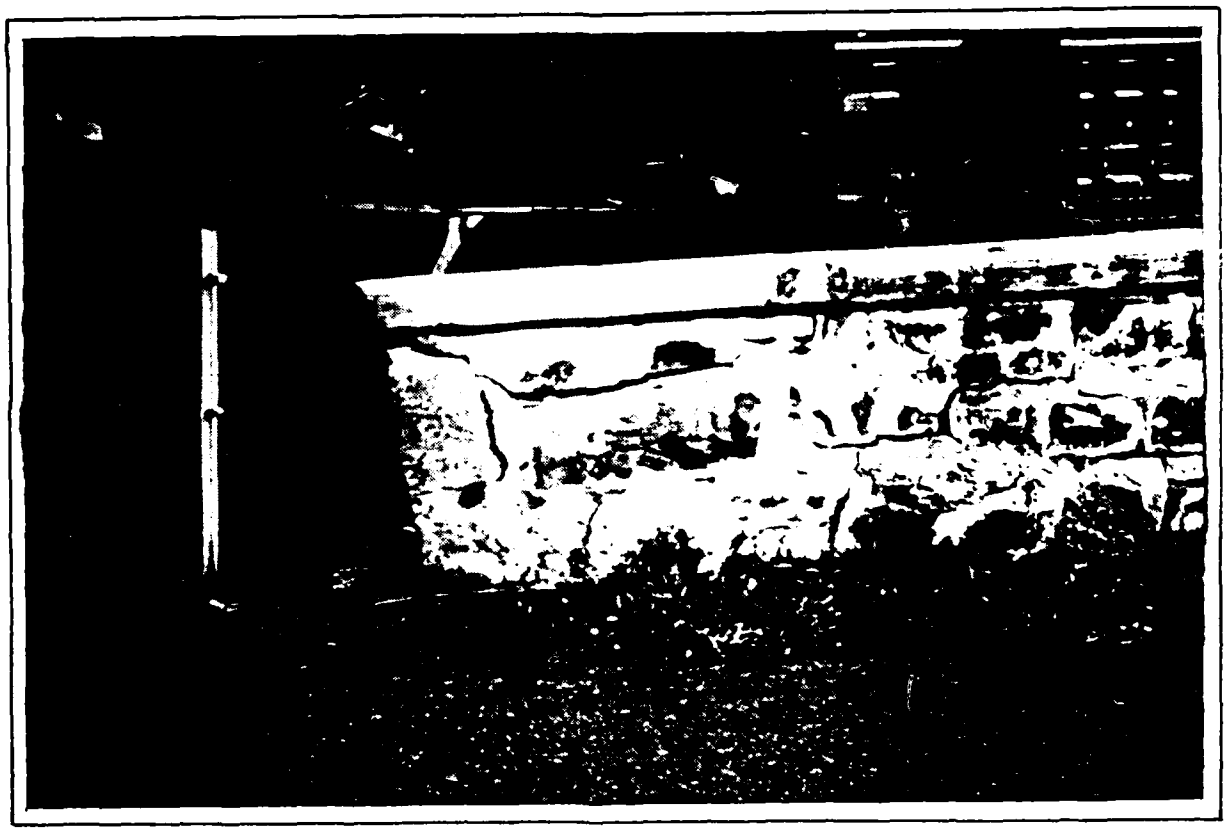
PHOTOGRAPH NO. 7

OVERALL VIEW OF DOWNSTREAM SLOPE.

PHOTOGRAPH NO. 8

DAMAGE TO WALL NEAR RIGHT ABUTMENT.

PHOTOGRAPH NO. 9



CRACKING OF PARAPET WALL OF BRIDGE.

PHOTOGRAPH NO. 10

DETERIORATION OF MORTOR JOINTS ON
OUTSIDE OF LEFT SPILLWAY WALL.

PHOTOGRAPH NO. 11

APPENDIX

D

SPRING MILL DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *Predominantly open with steep watershed slopes.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *345.0 feet. (230 Acre-Feet).*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *348.7 feet (269 Acre-Feet).*

ELEVATION MAXIMUM DESIGN POOL: ---

ELEVATION TOP DAM: *348.7 feet.*

SPILLWAY

a. Elevation *345.0 feet (elevation without flashboards).*

b. Type *Broad crest stone weir.*

c. Width *The downstream edge is 40'4" long.*

d. Length *N/A*

e. Location Spillover *Left abutment.*

f. Number and Type of Gates *None*

OUTLET WORKS:

a. Type *Stone "screen chamber" or intake tower.*

b. Location *Adjacent to upstream face of dam at midpoint.*

c. Entrance inverts *8, 12 and 16 feet below water level.*

d. Exit inverts *N/A, line goes directly into water treatment plant.*

e. Emergency draindown facilities *30" CI pipe through base of dam.*

HYDROMETEOROLOGICAL GAGES:

a. Type *None*

b. Location *N/A*

c. Records *N/A*

MAXIMUM NON-DAMAGING DISCHARGE: *Not determined.*

HYDROLOGIC AND HYDRAULIC BASE DATA

DRAINAGE AREA:(1) *3.0 square miles.*

100 YEAR PRECIPITATION(2)

30 MINUTES *2.3"*

1 Hours *2.9"*

2 Hours *3.6"*

3 Hours *4.0"*

6 Hours *4.8"*

12 Hours *5.9"*

24 Hours *6.9"*

SNYDER HYDROGRAPH PARAMETERS:(4)

Zone *3*

C_p, C_t *0.45, 1.45*

L(5) *3.41 miles*

Lca (6) *1.52 miles*

$tp=C_t\ (L \cdot Lca)^{0.3}$ *2.38*

SPILLWAY CAPACITY AT MAXIMUM WATER LEVEL(7) *958 cfs without flashboards, 533 with flashboards.*

---

(1) Measured from USGS maps.
(2) TP 40 - Rainfall Frequency Atlas of the United States
(4) Information received from Corps of Engineers, Baltimore District.
(5) Length of longest water course from outlet to basin divide, measured from USGS maps.
(6) Length of water course from outlet to point opposite the centroid of drainage area, (see Plate 1, Appendix E) measured from USGS maps.
(7) See Sheet 5 of this Appendix.

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputed and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MFB DATE 2/8/80 SUBJECT Spring Mill Dam Hydrology / Hydraulics SHEET 4 OF 11
CHKD. BY AHD DATE 2/20/80 JOB No.

Classification (Ref. Recommended Guidelines for Safety Inspection of Dams)

1. The hazard classification is rated as "Significant" as there would be appreciable economic loss and possible loss of life in the event of failure.

2. The size classification is "Small" based on its 25 foot height and 269 Ac-Ft total capacity.

3. The selected spillway design flood, based on size and hazard classification, is the 100 yr. event.

Hydrology and Hydraulic Analysis

1. Original Data. No original design data or subsequent evaluation data is known to exist.

2. Evaluation Data.
Rainfall and Snyder's Hydrograph parameters are shown on sheet 2. The value of the peak inflow value is checked against the peak 100yr inflow value (Q_{100}) determined by procedures contained in "Regional Frequency Study, Upper Delaware and Hudson River Basins, New York District."

$\log(Q_m) = C_m + 0.87 \log(D.A.)$
where $C_m = 1.75$ from fig. 2 ✓
D.A. = 3.0 sq. miles from sheet 2
$\log(Q_m) = 2.165$ ✓

$S = C_s - 0.05 \log(D.A.)$
where $C_s = 0.403$ from fig. 3 ✓
$S = 0.379$ ✓

$g = +0.4$ from fig. 5 ✓

$\log(Q_{100}) = \log(Q_m) + k(P,g)\,S$
where $k(P,g) = 2.62$ from table ✓
$\log(Q_{100}) = 2.165 + 2.62 \cdot 0.379$
$= 3.158$ ✓
$Q_{100} = 1439$ cfs ✓

BY MEB DATE 2/11/80 SUBJECT Spring Mill Dam Hydrology / Hydraulics SHEET 5 OF 11

CHKD. BY AHD DATE 2/20/80 JOB No.

Elevation - Storage Data. The reported normal storage is 75 mgal or 230 Ac-Ft. Surface area measured from original reservoir drawing is 9.3 Ac., area within 350 contour measured from USGS is 11.9 Ac.

Elevation - Discharge Data.

Without flashboards - the downstream edge of weir is 40'4".

$Q = C L H^{3/2}$

C varies with H, Table 5-13, King & Brater Handbook of Hydraulics

Water Surface	H	C	L	Q	
345.	0			0	
346.	1.0	3.54	40.33'	143 cfs	✓
347	2.0	3.50	"	399 cfs	✓
348	3.0	3.27	"	685 cfs	✓
350.	5.0	3.25	"	1465 cfs	✓

With flashboards - their length is slightly longer, say 41.3'. Assume flash boards do not fail

346.2	0	3.1	41.3	0	
347.0	0.8	3.1	41.3	92 cfs	✓
348.0	1.8	3.1	41.3	309 cfs	✓
350.0	3.8	3.1	41.3	948 cfs	✓

3. Results of computer analysis. The peak inflow (Q_{100}) calculated by the HEC-1 program is 1425 cfs, close to the value calculated on sheet 4. The program indicates the dam will be overtopped by the 100 yr event. The dam reportedly has not been overtopped since 1945. A need for a more detailed hydrologic/hydraulic analysis is indicated.

4. Spillway Adequacy - the spillway is considered "Inadequate" as it will not pass the selected spillway design storm without overtopping the dam. The spillway is not considered "Seriously Inadequate" as the dam is not assessed to fail by overtopping during the spillway design flood.

```
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79

RUN  DATE= 80/02/12.
     TIME= 05.39.20.
```

SPRING MILL DAM
NAT ID NO. PA 00875 DER NO. 39-1
OVERTOPPING ANALYSIS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
100	0	20	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	IRALE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

SHEET 6 OF 11

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	1	3.00	0.00	3.00	1.00	0.000	0	1	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 2.38 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 64 END-OF-PERIOD ORDINATES, LAG= 2.40 HOURS, CP= .45 VOL= 1.00

16.	62.	125.	199.	272.	330.	365.	370.	348.	318.
291.	266.	243.	222.	203.	186.	170.	156.	142.	130.
119.	109.	99.	91.	83.	76.	70.	64.	58.	53.
49.	44.	41.	37.	34.	31.	28.	26.	24.	22.
20.	18.	17.	15.	14.	13.	12.	11.	10.	9.
8.	7.	7.	6.	6.	5.	5.	4.	4.	4.
3.	3.	3.	3.						

Assumed Rainfall Distribution (Ref - EM 1110-2-1411)

0 72									
010.	.002	.002	.002	.002	.002	.003	.003	.003	.003
01.003	.003	.003	.003	.003	.003	.003	.003	.06	.06
01.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
01.06	.06	.06	.06	.06	.07	.07	.07	.07	.1
01.1	.1	.23	.23	.24	.96	.97	.97	.13	.13
01.14	.1	.1	.1	.003	.003	.003	.003	.003	.003
01.003	.003	.003	.003	.003	.003	.003	.002	.002	.002
01.002	.002								

SHEET 7 OF 11

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-345.	-1

Without flashboards

STAGE	345.00	346.00	347.00	348.00	350.00
FLOW	0.00	143.00	399.00	685.00	1465.00
CAPACITY=	230.	283.			
ELEVATION=	345.	350.			

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
345.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
348.7	0.0	0.0	0.

CREST LENGTH	190.	215.	280.
AT OR BELOW ELEVATION	348.7	349.0	350.0

PEAK OUTFLOW IS 1419. AT TIME 18.00 HOURS

SHEET 8 OF 11

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

WITHOUT FLASH BOARDS

				RATIOS APPLIED TO FLOWS
OPERATION	STATION	AREA	PLAN	RATIO 1
				1.00
HYDROGRAPH AT	IN	3.00	1	1425.
		(7.77)		(40.35)(
ROUTED TO	OUT	3.00	1	1419.
		(7.77)		(40.19)(

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	345.00	345.00	348.70
STORAGE	230.	230.	269.
OUTFLOW	0.	0.	958.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	349.24	.54	275.	1419.	3.33	18.00	0.00

SHEET 9 OF 11

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

	NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
	1	0	0	0.000	0.000	0.000	-345.	-1

With Flashboards

STAGE	345.00	346.20	347.00	348.00	350.00
FLOW	0.00	0.00	92.00	309.00	948.00

CAPACITY=	230.	263.
ELEVATION=	345.	350.

CREL	SPWID	CORW	EXPW	ELEVL	COOL	CAREA	EXPL
346.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
348.7	0.0	0.0	0.

CREST LENGTH	190.	215.	280.
AT OR BELOW ELEVATION	348.7	349.0	350.0

PEAK OUTFLOW IS 1421. AT TIME 18.00 HOURS

SHEET 10 OF 11

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

WITH FLASHBOARDS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1
				1.00
HYDROGRAPH AT	IN	3.00	1	1425.
		(7.77)		(40.35)(
ROUTED TO	OUT	3.00	1	1421.
		(7.77)		(40.24)(

SUMMARY OF DAM SAFETY ANALYSIS

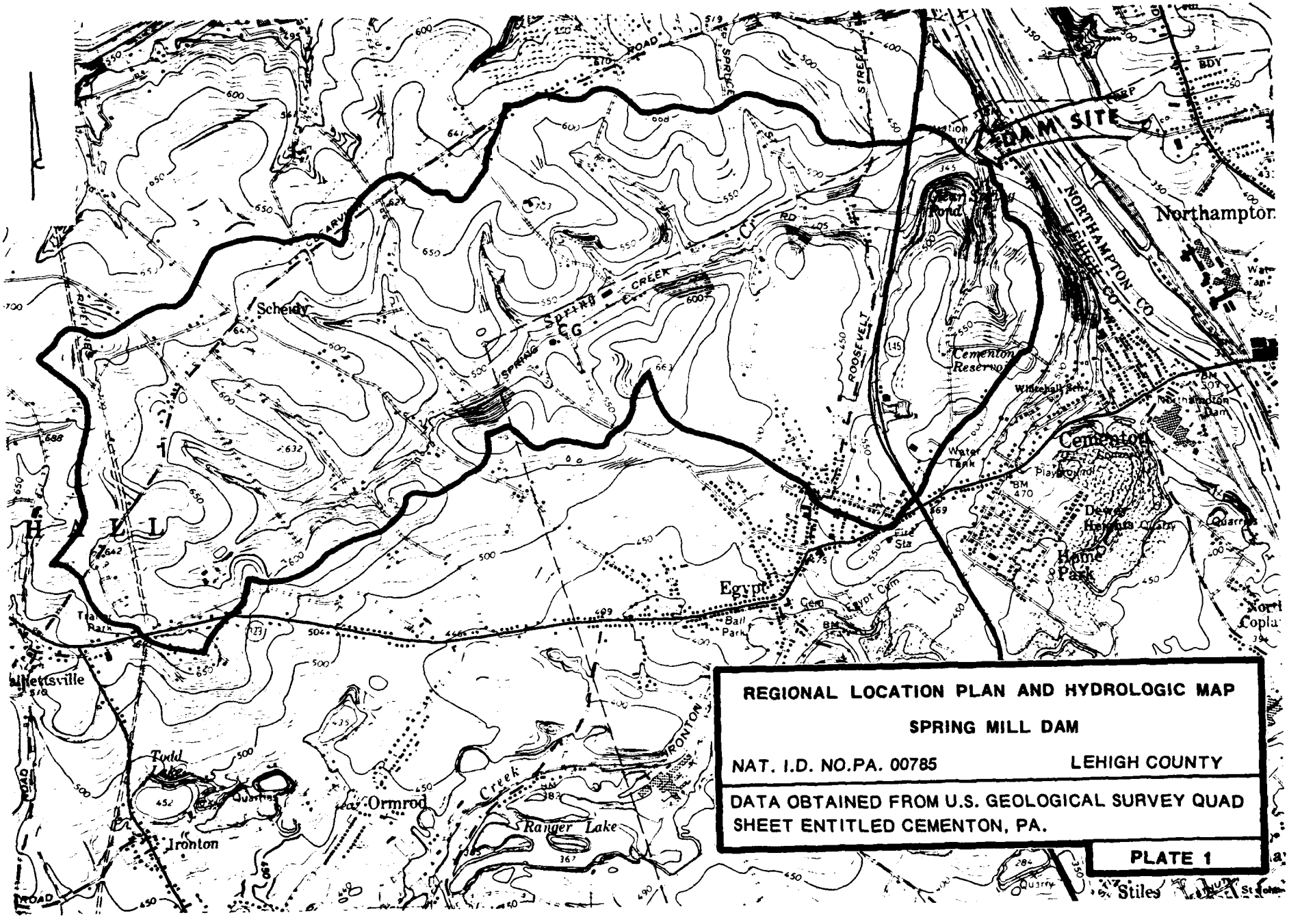
	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	345.00	346.20	348.70
STORAGE	230.	243.	269.
OUTFLOW	0.	0.	533.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	349.62	.92	279.	1421.	6.00	18.00	0.00

SHEET 11 OF 11

APPENDIX

E



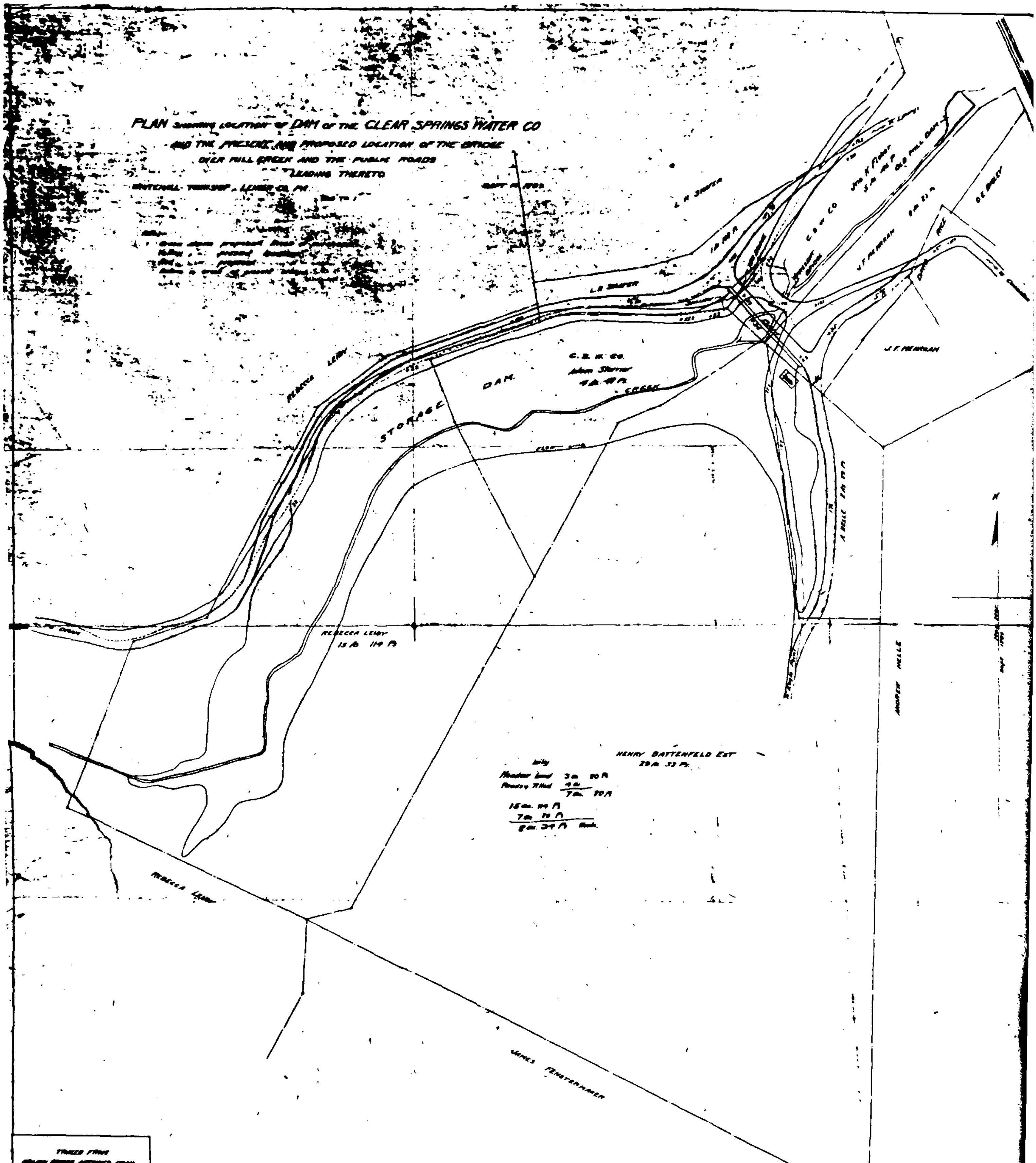
REGIONAL LOCATION PLAN AND HYDROLOGIC MAP

SPRING MILL DAM

NAT. I.D. NO.PA. 00785 LEHIGH COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEET ENTITLED CEMENTON, PA.

PLATE 1


PLAN SHOWING LOCATION OF DAM OF THE CLEAR SPRINGS WATER CO
AND THE PRESENT AND PROPOSED LOCATION OF THE BRIDGE
OVER MILL CREEK AND THE PUBLIC ROADS
LEADING THERETO
L. R. Shafer
Rebecca Leiby
C. S. W. Co.
STORAGE DAM
CREEK
J. F. Mehrham
A. Nelle
Andrew Nelle
Rebecca Leiby
15 A. 114 P.
HENRY BATTENFELD EST
Rebecca Leiby
JAMES FENSTERMAKER
TRACED FROM
C. O. WEIRBACH
CHAS. D. WEIRBACH CIV. ENG.
ALLENTOWN, PA.

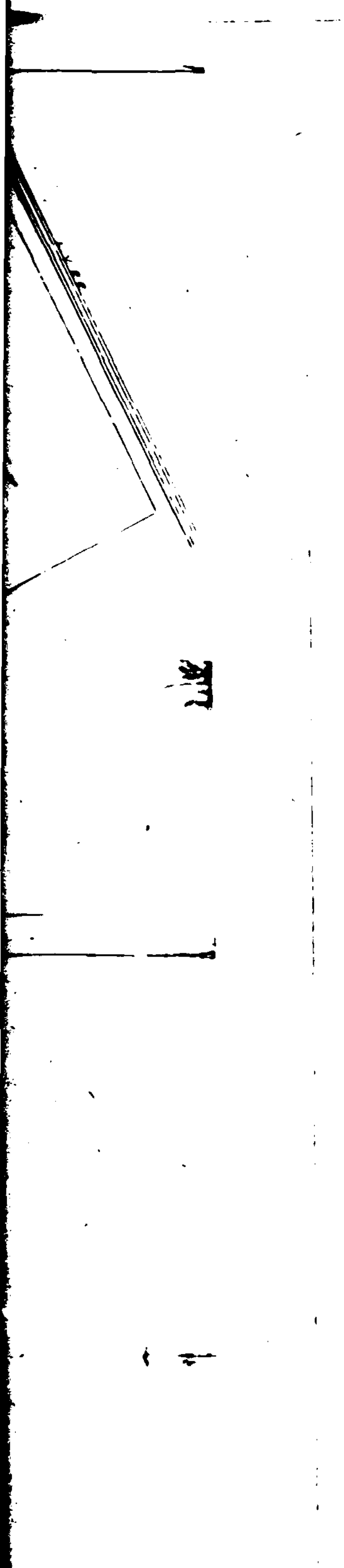
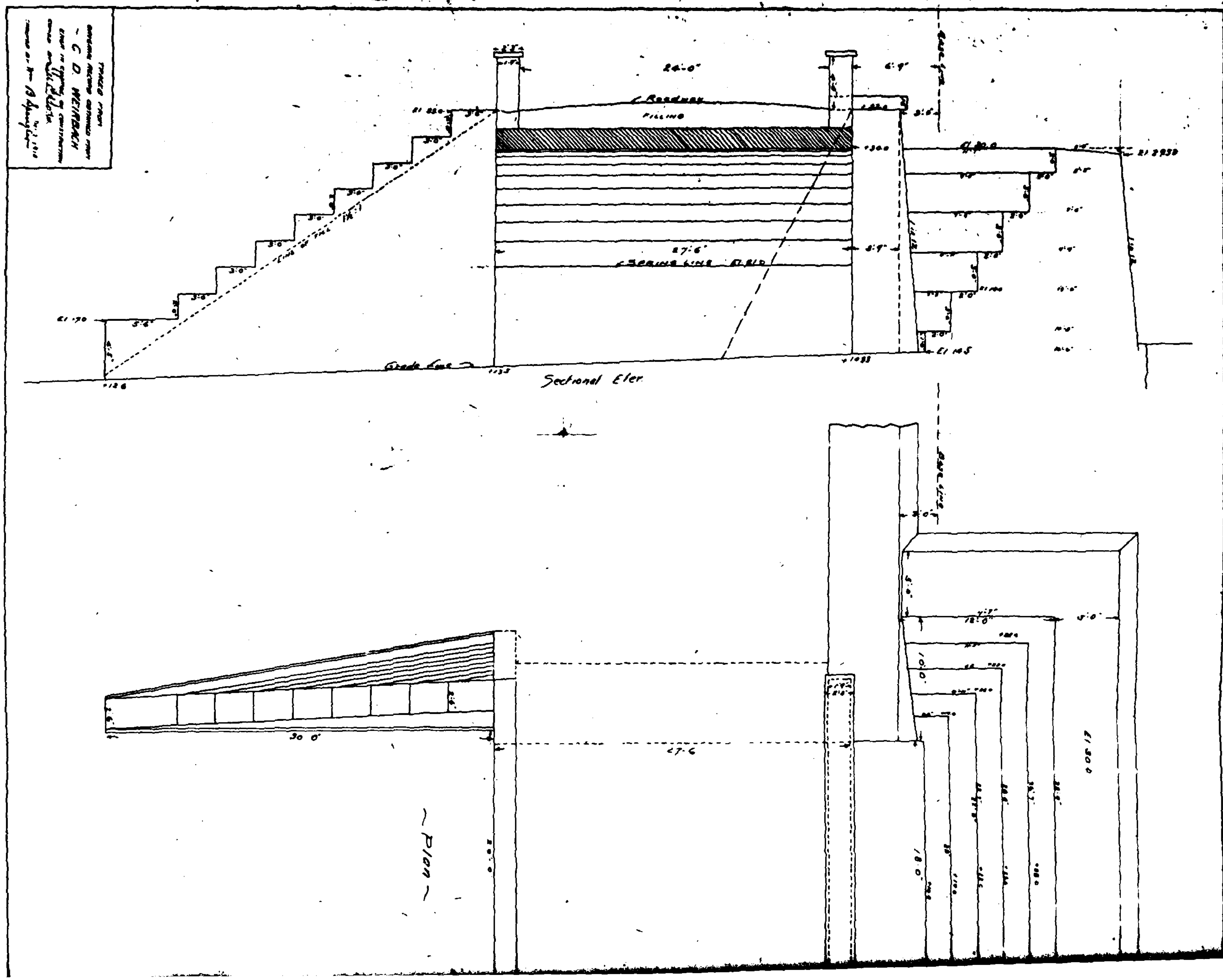
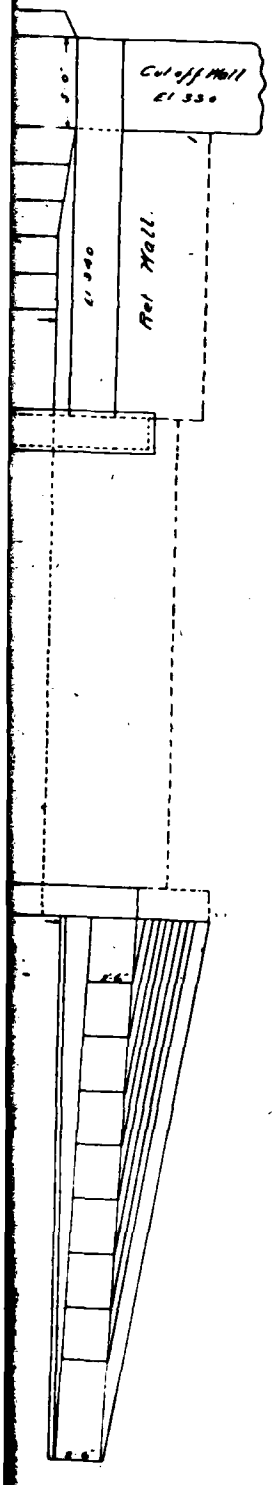


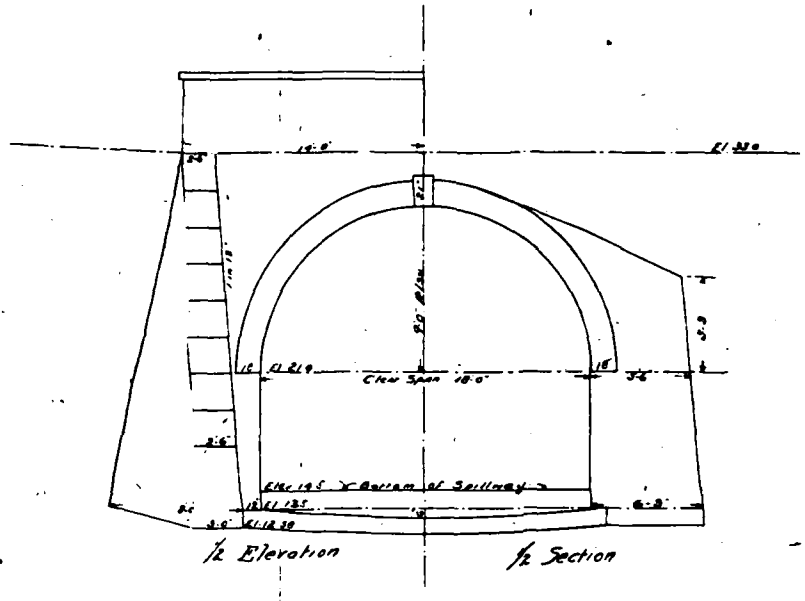
PLATE 2

2



TRACED FROM
ORIGINAL RECORD OBTAINED FROM
C. D. WEIRBACH
Sectional Elev.
Plan
Roadway
Filling
Spring Line
Grade Line
Base Line





PLAN of SPILLWAY and BRIDGE over BYWASH
MILL CREEK DAM of the
CLEAR SPRINGS WATER CO

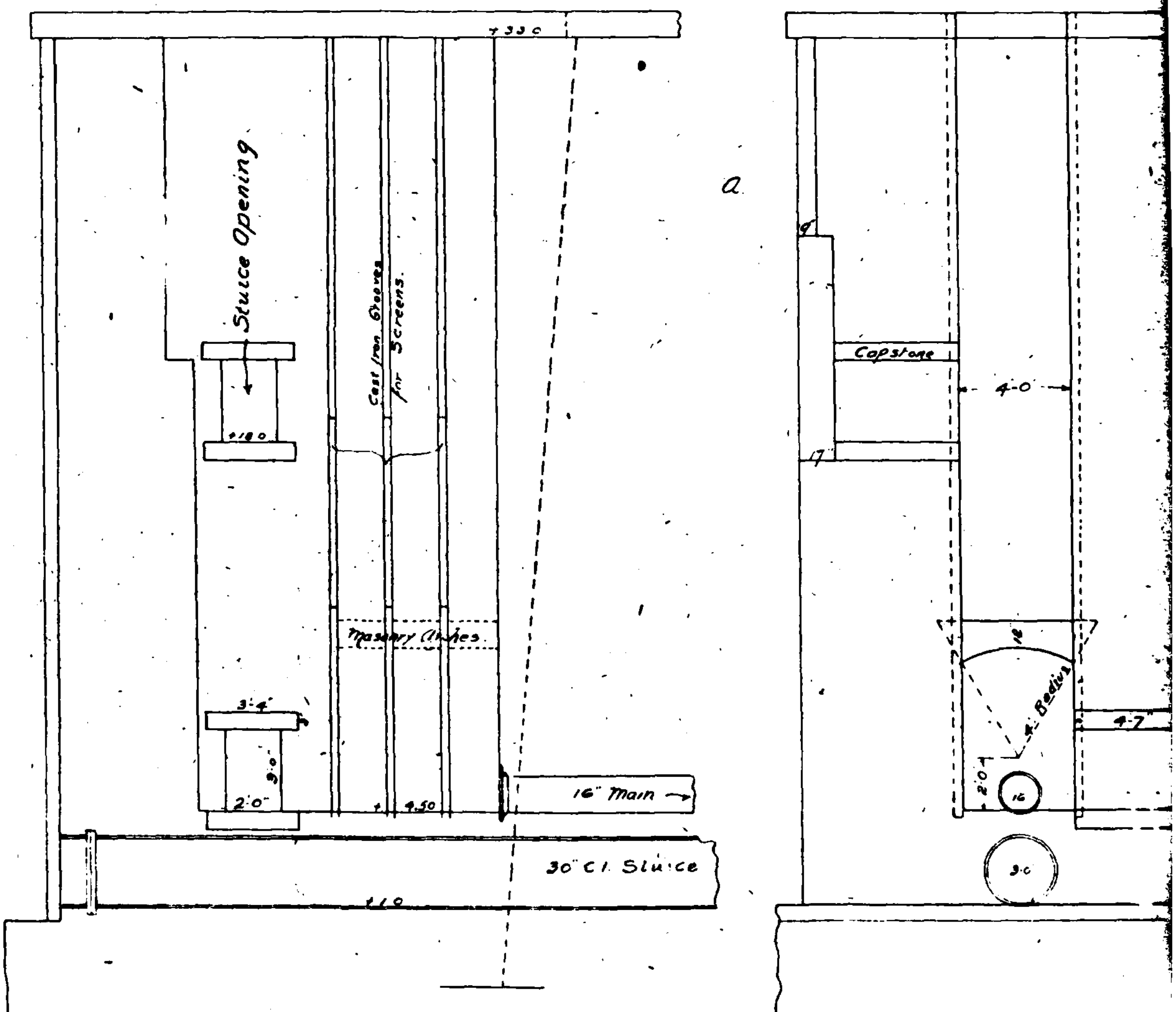
Scale 4ft to 1in

Apr 14 1900

3 PLATE 3

1

2



Section C-D

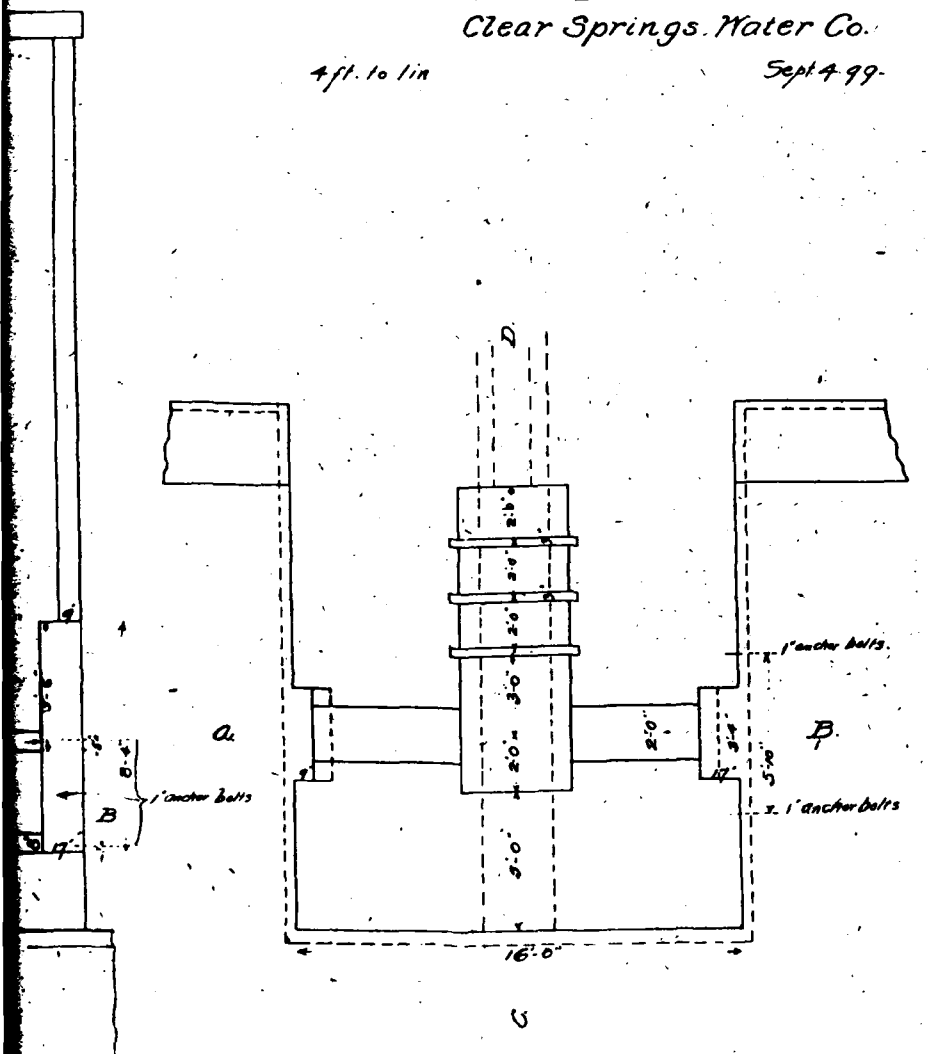
TRACED FROM
ORIGINAL RECORD OBTAINED FROM
C D WEIRBACH

Wm B Spengler

Plan of Screen Chamber.
Mill Creek Dam
Clear Springs Water Co.

4 ft. to 1 in

Sept 4 99.

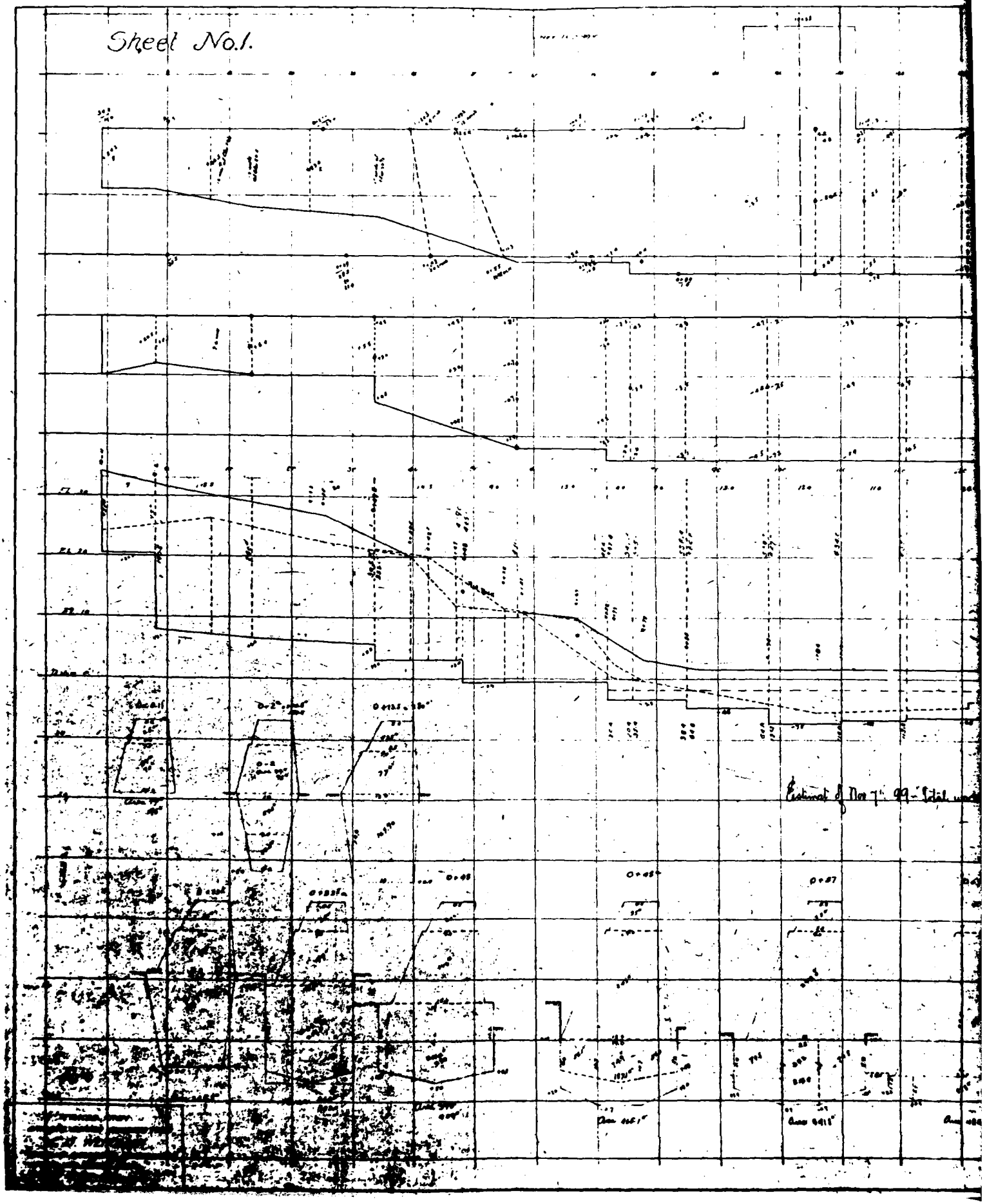


2

PLATE 4

2

Sheet No.1.



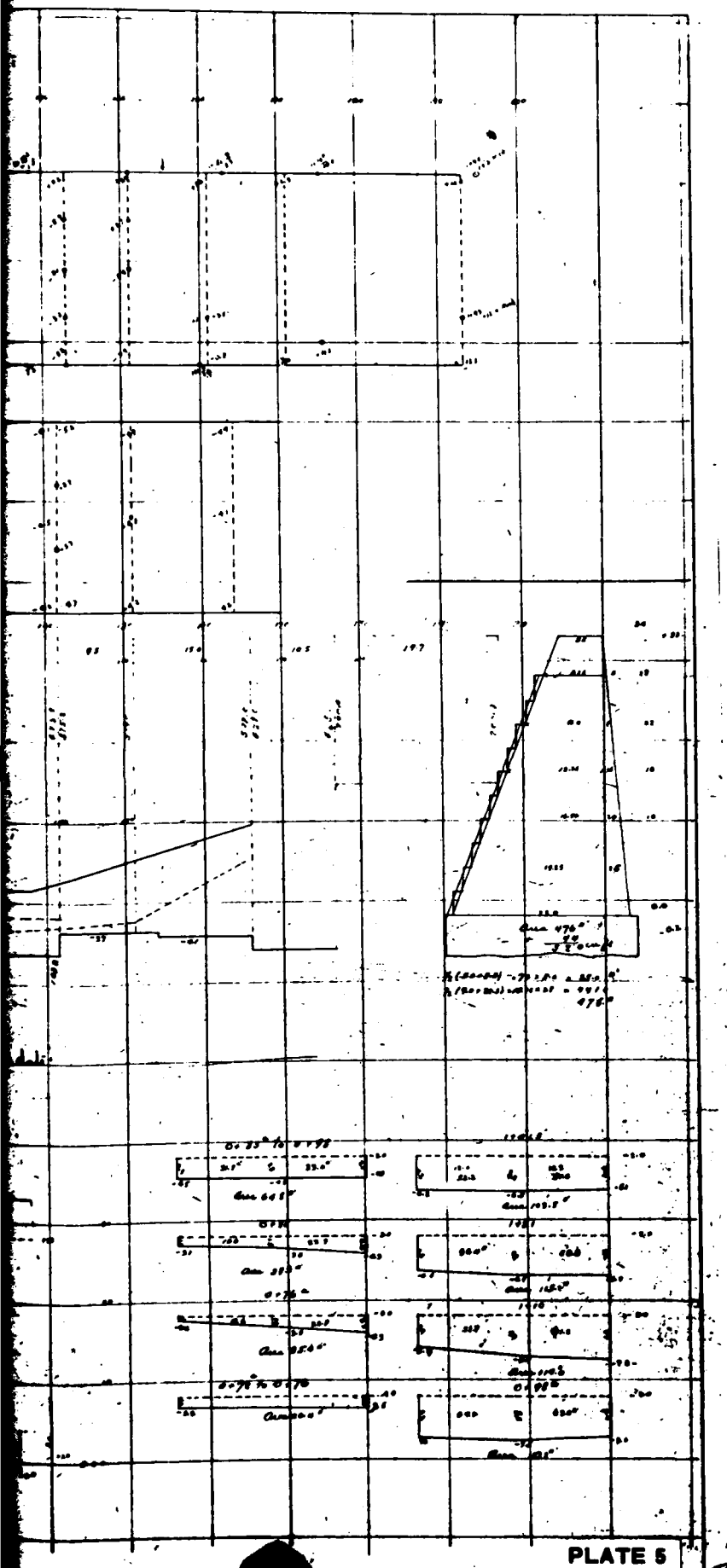
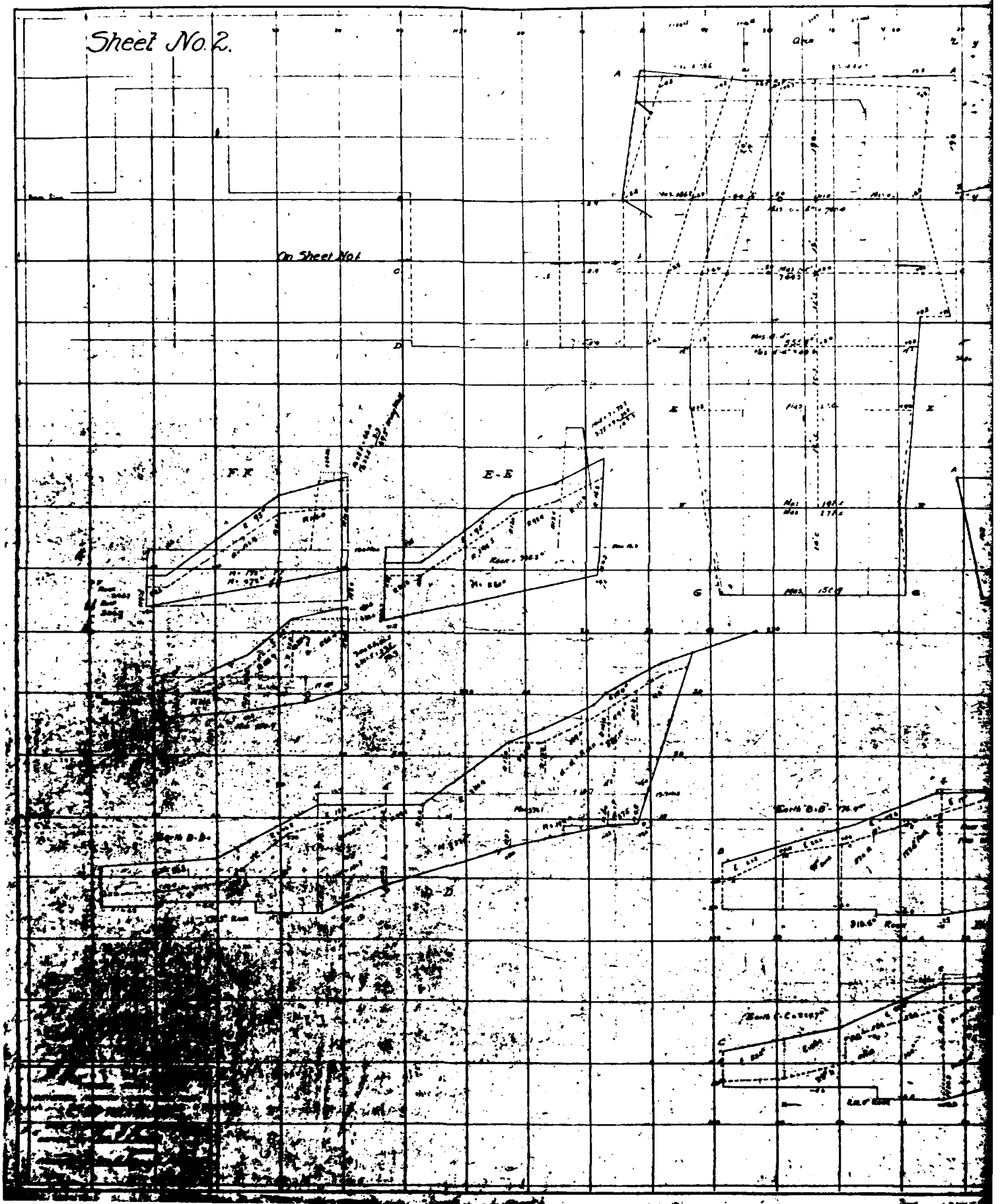


PLATE 5


Sheet No. 2.
On Sheet No. 1
F-F
E-E
D-D

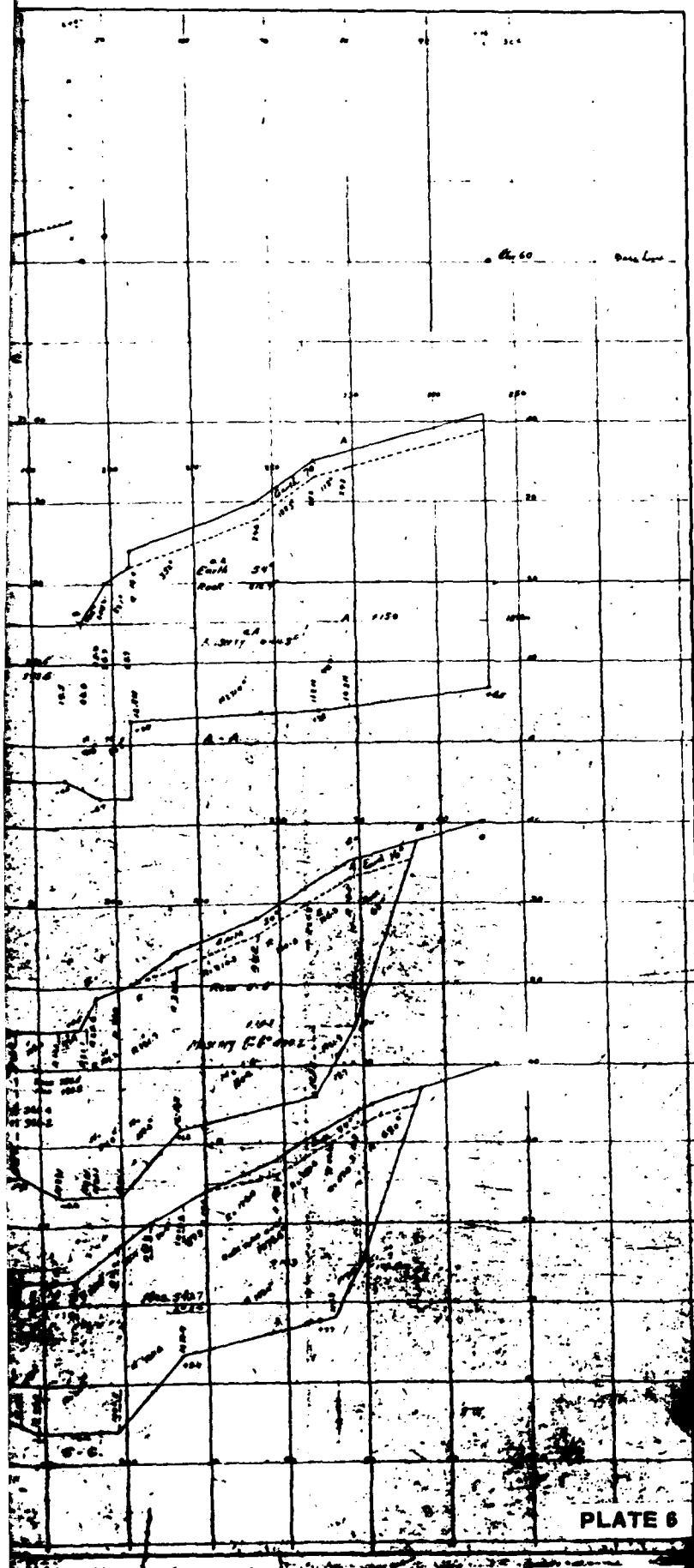


PLATE 6

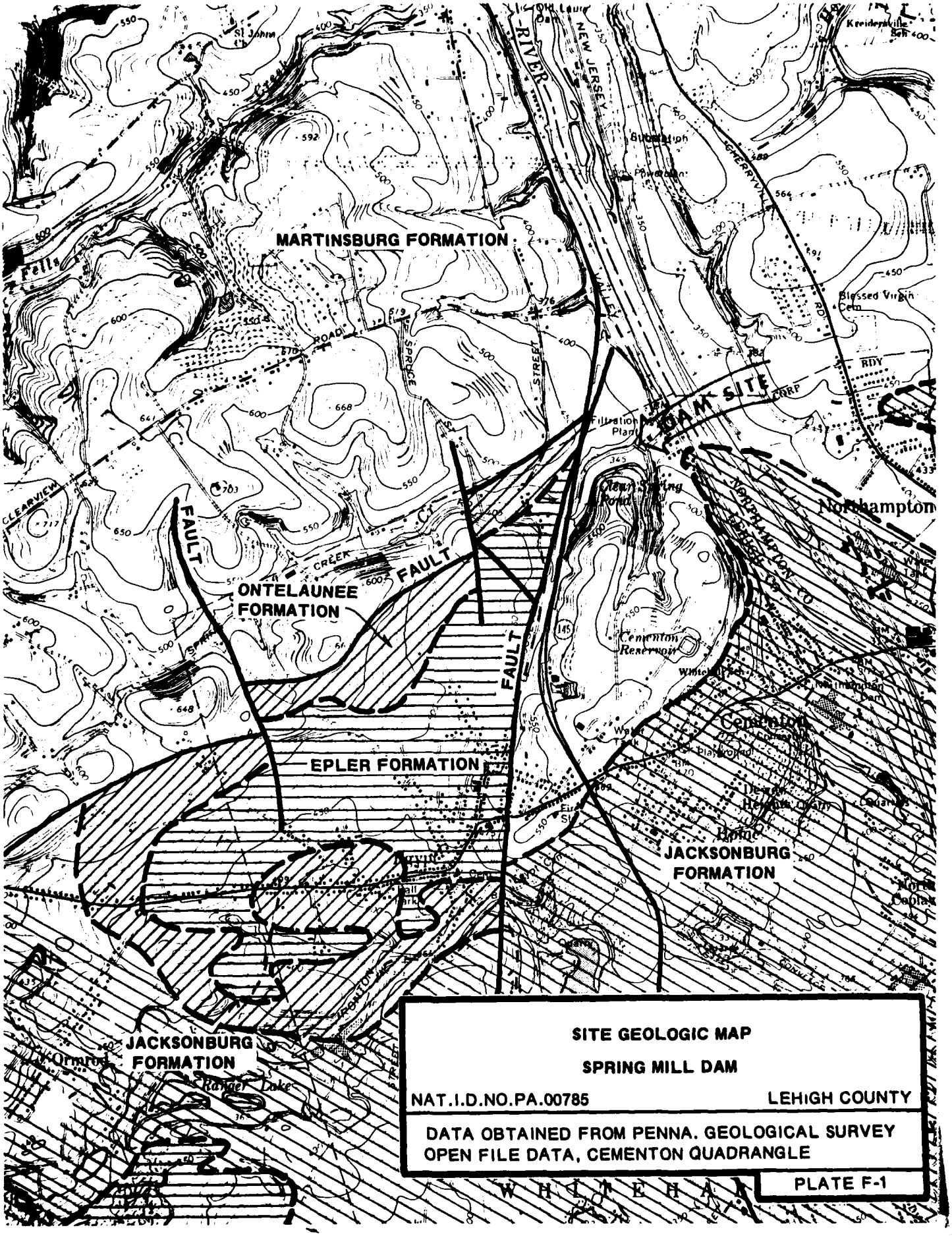
APPENDIX

F

SITE GEOLOGY
SPRING MILL DAM

Spring Mill Dam is located in the Great Valley Section of the Valley and Ridge Physiographic Province. As shown in Plate F-1, the dam is underlain by the Martinsburg Formation, which consists of Ordovician age claystone slate having siltstone interbeds. South of the dam area, carbonate bedrock predominates.

The strike and dip of bedding in rock exposures in the immediate dam area are variable; for example, bedding in the spillway channel strikes north-northwest, dipping 23 degrees to the southwest (upstream direction); bedding in the roadcut above the left abutment strikes north-northeast, dipping 21 degrees to the southeast. Near vertical rock jointing strikes east-northeast in the spillway channel area; elsewhere, jointing strikes to the northwest and northeast. Evidence of minor faulting was observed in the spillway channel and nearby roadcuts. Bedrock was observed in the spillway channel and nearby roadcuts. Bedrock related seepage should not be of concern due to the soundness of the rock and the upstream direction of the bedding dip. Minor seepage could be expected along select joint planes.



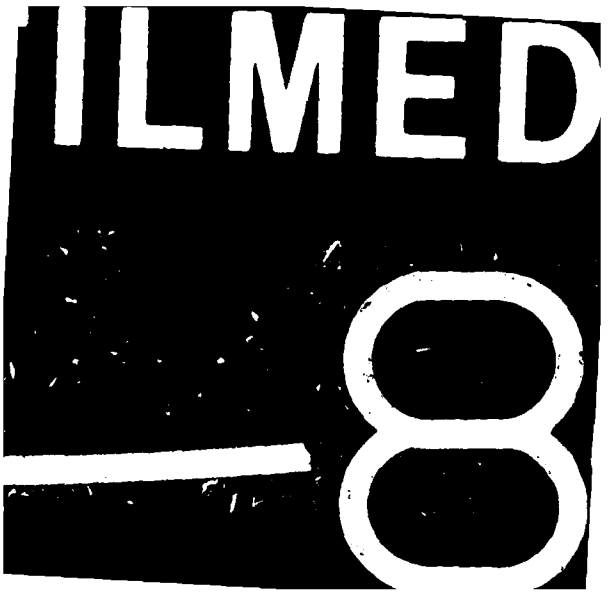
SITE GEOLOGIC MAP

SPRING MILL DAM

NAT.I.D.NO.PA.00785 LEHIGH COUNTY

DATA OBTAINED FROM PENNA. GEOLOGICAL SURVEY
OPEN FILE DATA, CEMENTON QUADRANGLE

PLATE F-1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